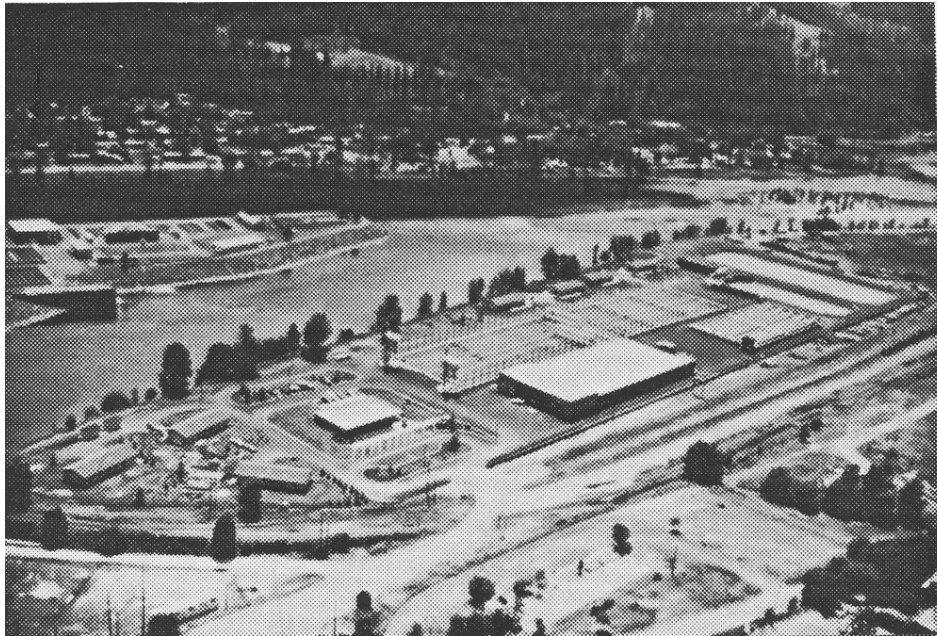




CLEARWATER FISH HATCHERY
1993 CHINOOK BROOD YEAR
1994 STEEHEAD BROOD YEAR REPORT



BY:
Jerry McGehee, Fish Hatchery Manager II
Brad Dredge, Assistant Fish Hatchery Manager

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ABSTRACT

Clearwater Hatchery

Spring chinook salmon *Oncorhynchus tshawytscha* were raised at Clearwater Hatchery (CFH). All chinook were brought on station as either green or eyed eggs, then reared on station until they were transported to the satellite facilities or directly released.

Red River

Red River weir was installed on June 9, 1993 and taken out of operation on September 15, 1993. The spring chinook run total was 139 fish: 73 adult males, 65 adult females and one jack. Forty-eight males, 42 females, and one jack were released during the trapping season to spawn naturally. Twenty-five males and 23 females were held for spawning. These 23 females were spawned and produced 99,908 green eggs.

A total of 320,755 spring chinook pre-smolts were released from the Red River pond on September 23, 1994. These pre-smolts were a mixture of Red River and Rapid River stocks.

Crooked River

The Crooked River weir was installed on June 8, 1993 and taken out of operation on September 10, 1993. The run total was 402 fish; 185 adult males, 210 adult females, six jacks, and one jill. Fifty-two males and 50 females were released immediately to spawn naturally; 25 males and 25 females were held for a later release until the fish were ready to spawn; and were then transported by truck back to Crooked River from Red River. A total of 129 females were spawned and this produced 614,789 green eggs.

There is no adult holding facility at the Crooked River fish trap. Poned fish were removed from trap and transported 28 miles to the Red River facility. All Crooked River chinook were segregated from the Red River chinook. All poned fish were held at the Red River facility until spawning was completed.

A total of 199,255 Crooked River stock pre-smolts were released on September 19, 1994 and 216,280 Rapid River stock were released on September 30, 1994 from the upper Crooked River rearing ponds. A total of 258,293 full term smolts from Crooked River stock and an additional 279,615 Rapid River stock full-term smolts were direct released from upper Crooked River on April 14, 1995.

Powell

The Walton Creek weir was installed on June 10, 1993 and taken out of operation on September 9, 1993. The run total was 500 fish: 250 adult males, 242 adult females, and 8 jacks. All fish trapped were ponded and held for spawning. A total of 203 females were spawned; this produced 936,572 green eggs.

During August 1994, fingerling chinook were released for chinook supplementation plants at five locations: 99,808 pre-smolts were planted by helicopter into White Sands Creek; 49,954 pre-smolts were released by helicopter into Big Flat Creek; 15,080 pre-smolts were directly released into Pete King Creek; and 14,977 pre-smolts were released directly into Squaw Creek.

A total of 311,690 pre-smolts, from a mixed stock of Rapid River and Powell chinook, were released from the Powell pond on October 3, 1994. A total of 290,417 full-term smolts were released on April 13, 1995 and a total of 19,791 Powell stock smolts were released in Papoose Creek on April 5 and 6, 1995.

Rapid River

During the 1993 spawning season, eggs from 568 Rapid River females were transferred to CFH. All females were disease sampled for Bacterial Kidney Disease (BKD) during incubation. The high BKD eggs were removed and destroyed at eye-up. The eggs from 53 females (9.3%) were culled. A total of 2,553,000 green eggs were received; a total of 1,842,458 eyed eggs were retained for rearing. Final eye-up was 84%.

A total of 417,000 Rapid River stock chinook fingerlings were released into Meadow Creek, a tributary to the Selway River, during August 1994. These plants were done by helicopter because of the remote location of this drainage.

A total of 35,509 full-term smolts were planted into Papoose Creek on April 5 and 6, 1995, 221,449 were planted in American River April 5 through 10, 1995, and 189,612 into Newsome Creek April 10 and 11, 1995.

Authors:

Jerry McGehee
Fish Hatchery Manager II

Brad Dredge
Assistant Fish Hatchery Manager

INTRODUCTION

Funding Source

Construction responsibility for the Lower Snake River Compensation Plan (LSRCP) was assigned to the Walla Walla District, Army Corps of Engineers (Corps), while responsibility for fish hatchery Operation and Maintenance (O&M) funding was to be accomplished by "one of the federal fisheries agencies." The question of O&M funding was settled in 1977 with the signing of an interagency agreement by the Corps, National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (FWS). The agreement stated the FWS would budget for and administer O&M funding for LSRCP fish hatchery programs (responsibility for administration and O&M for fish passage and wildlife programs remains with the Corps).

The Corps estimated cost for construction of CFH and three satellite facilities was to be \$43,153,000 (Joe McMichael's report December, 1991).

Location

The CFH is located on the north bank of the North Fork of the Clearwater River, 1.5 miles downstream from Dworshak Dam, 72.5 miles upstream from Lower Granite Dam, and 504 miles upstream from the mouth of the Columbia River.

Red River satellite facility is located 15 miles east of Elk City, Idaho, 186 miles upstream from Lower Granite Dam and 618 miles from the mouth of the Columbia River.

Crooked River satellite facility is located 20 miles downstream of Red River. The trap is located one-half mile upstream of the mouth of Crooked River, a tributary of the South Fork of the Clearwater River. The juvenile rearing ponds are ten miles upstream from the Crooked River adult trap. Crooked River is 172.5 miles upstream from Lower Granite Dam and 604 miles upstream from the mouth of the Columbia River.

Powell satellite facility is located 122 miles east of the CFH at the headwaters of the Lochsa River and Missoula, Montana is the closest town 45 miles east of the Powell facility. Powell is 192.5 miles upstream from Lower Granite Dam and 624 miles upstream from the mouth of the Columbia River.

OBJECTIVES

Mitigation Goals

The goal of CFH and satellite facilities is to return 12,000 adult salmon and 14,000 adult steelhead over Lower Granite Dam.

Idaho Department of Fish and Game Objectives

The objectives of Idaho Department of Fish and Game (IDFG) for the CFH are to re-establish historic fish runs into the upper Clearwater River tributaries, to enhance the wild spawning population, and increase sport and tribal fish opportunities.

FACILITY DESCRIPTION

General Hatchery Description

Clearwater Hatchery

The CFH is the final facility to be built by the U.S. Army Corps of Engineers under the LSRCP. This facility is also the largest of the LSRCP hatcheries.

Support buildings include:

An administration/dormitory building consisting of office space with a visitor reception area in the entryway to the office and a dormitory section that includes four bunk rooms with maximum capacity of 16 people, a living room, dining room, kitchen, shower rooms for men and women, and a laundry room; a shop area including a vehicle maintenance shop and a smaller mechanical repair shop; a screen storage room has been altered for use as a carpentry shop; the hatchery building also houses an incubation room and walk-in freezer; a screen and equipment storage building is located on the west end of the hatchery; seven residences located on the hatchery grounds with a storage building.

A 1.8 mile-long pipeline runs upstream to the Dworshak Dam. The pipeline goes up the face of the dam to an elevation of 1,357 ft then through the dam into the reservoir. The stationary 18-inch pipe is at an elevation of 1,357 ft with a screened inlet to keep out debris. This pipe supplies cool water to the hatchery. An 48-inch flexible plastic pipe is suspended from a floating platform, with a winch attached to the platform which raises and lowers the intake of the pipe to the level of desired water temperature. This pipe supplies warm water to the hatchery.

Near the dam is a distribution structure designed to reduce the 286 lbs/sq in (psi) of the high pressure supply lines to the gravity flow of seven psi to the hatchery. The structure consists of a primary and secondary chamber. Each chamber has two-ported sleeve valves that are used to reduce the pressure. One valve is in operation while the other is on standby for emergencies.

A 73,600 cubic foot (cf) cleaning sedimentation pond is used during cleaning of the raceways to settle the solids produced by the hatchery. A 414,000 cf final sedimentation pond settles waste from the total flow of hatchery operation and the out flow of the cleaning sediment.

Red River

The Red River site consists of three structures built on 6.29 acres. A freezer storage building housing a walk-in freezer, some dry storage shelves, an area to weigh out daily feed, a work shop and formalin storage building, and a support cabin.

Crooked River

There are two separate sites to this facility. The first is the adult trap and support cabin located one-half mile upstream of the mouth of Crooked River. The weir at this location consists of removable posts and panels supported by an iron bridge across Crooked River. The trap is a 9 ft x 13 ft x 4 ft deep holding container. There are no holding ponds at the site, and all fish are either released directly from the trap or transported to Red River holding ponds.

Ten miles upstream from the adult trap are two raceways measuring 145 ft x 20 ft x 4 ft deep with 23,200 cf of rearing space. There is a cleaning waste pond and final settling pond to meet EPA water quality standards. Additional facilities include a garage, shop, walk-in freezer to store fish food, and a support cabin with kitchen, dining room, living room, bathroom, and bedroom.

Powell

The Powell facility is located at the confluence of Crooked Fork and White Sands creeks, which form the Lochsa River. There is one rearing pond that measures 165 ft x 65 ft x 5 ft deep. A diversion and intake screen structure are located on Walton Creek, and a pump house on White Sands Creek. There are two adult ponds that measure 100 ft x 12 ft x 4 ft deep. A weir diverts fish that come up Walton Creek into the fish ladder and fish trap. A floating weir that spans across the Lochsa River is stored at the facility for use when needed. An open bay spawning shelter at the head the adult ponds provides work space. Also, on site is a support cabin with a kitchen, dining room, living room, bedroom, bathroom, and walk-in freezer to store fish feed. During the summer of 1994, the Corps constructed a 16 ft x 14 ft formalin storage building.

Production Capacities by Unit

Clearwater Hatchery

The steelhead rearing facilities consist of 300 ft x 10 ft x 6 ft deep raceways that are supplied by a center head raceway with an east and west bank of 12 raceways. A total rearing space of 24 raceways is 216,000 cf. This area will rear a maximum capacity of 2.4 million steelhead smolts with 0.3 density index (DI) (Piper). A flow of approximately 1.67 cf per second (cfs) is available for each raceway, but it is suspected this flow will only allow 1.7 million steelhead to be reared in these raceways without exceeding the flow index (FI) of 1.2 (Piper). All water for these raceways flow through degassing towers then into the head raceway. These raceways are supplied with water from the surface intake only.

Chinook raceways are 200 ft x 10 ft x 3 ft deep. Eleven raceways have a total rearing space of 66,000 cf. The raceways are supplied with water from both primary and secondary intakes and a mixing chamber which allows for the control of water temperature to rear chinook. The designed rearing capacity of these raceways is 1.5 million smolts at a 0.3 DI. The estimated flow per raceway is 2.4 cfs per raceway.

The adult holding facility consists of two ponds with a combined capacity of 8,000 cf and a maximum holding capacity of 800 adult salmon. There is also a covered spawning area with two live wells for on-site egg taking. This facility is supplied with water from the tail race of the juvenile chinook raceways. Estimated flow per pond is 3.5 cfs.

The incubation room contains 40 double stack Heath incubators with a total of 640 trays available for egg incubation. The upper and lower half of each stack (eight trays each) has a different water supply and drain. This design aids in segregation of diseased eggs. The maximum capacity of this facility is five million green eggs. The incubation room is supplied with both water sources to provide the desired temperature for incubation with a flow of 5 gpm to 8 gpm per one-half stack.

Sixty concrete vats, measuring 40 ft x 4 ft x 3 ft deep, are located inside the hatchery building for early rearing and contains 480 cf of rearing space in each. This part of the facility can rear 5.9 million fish to 287 fish/lb at a 0.3 DI. The vats are supplied with water from each intake and have a flow of approximately 120 gal/min per vat when all vats are in use. Every vat also has an incubation jar plumbed directly into them, the incubator jars have a total capacity of 2.6 million eggs with a flow of 15 gpm/jar.

Red River

The adult holding facility consists of two ponds, measuring 10 ft x 45 ft x 4 ft deep, with a total of 3,400 cf of holding space and a trap area 8 ft x 16 ft x 4 ft deep. These ponds have a holding capacity of 350 fish. A removable tripod and panel weir block fish passage and diverts them into the fish ladder. There is a 4.09 cfs water flow through the ponds and trap.

A 170 ft x 70 ft x 4 ft 6 in deep-rearing pond will rear a maximum of 320,000 chinook smolts. This pond has a hypalon plastic liner with eight- to ten-inch diameter cobblestones on the inclined banks. The bottom of the pond is a bare liner which aids in pond vacuuming. A catwalk runs the entire length of the rearing pond and holds eight automatic Nielson feeders. Water flow through the ponds is 4.09 cfs.

Crooked River

The Crooked River facility has two raceways, measuring 145 ft x 20 ft x 4 ft deep, for a total of 23,200 cf. These raceways have a capacity of 700,000 juvenile chinook with a DI of 0.29, with a water flow per raceway of 6 cfs. Each raceway is outfitted with three automatic Nielson feeders. The adult trapping facility measures 10 ft x 12 ft x 4 ft deep with a total of 480 cf with a water flow is 10 cf.

Powell

The rearing pond measures 165 ft x 65 ft x 5 ft deep and has 53,625 cf of rearing space. The normal loading of 320,000 fish produces the best looking smolts and a DI significantly under 0.3. The maximum design capacity is 500,000 fish with a DI of 0.092, with water flows through the pond of 6.24 cfs. A catwalk across the length of the pond supports eight automated Nielson feeders.

The adult ponds, measuring 100 ft x 20 ft x 4 ft 8 in deep, have a volume of 9,500 cf and a holding capacity of 960 adult chinook. The adult trap measures 12 ft x 6 ft x 4 ft deep and is supplied with 6.24 cfs of water.

WATER SUPPLY

Source

Clearwater

The CFH receives water through two supply pipelines from Dworshak Reservoir. The warmwater intake is attached to a floating platform and can be adjusted from 5 ft to 40 ft below the surface. The cool water intake is stationary at about 245 ft below the top of the dam. An estimated 10 cfs of water is provided by the cool water supply and 70 cfs of water from the warmwater supply. The cool water supply has remained constant at 40°F. The warmwater can reach 80°F but is adjusted regularly to maintain 56°F for as long as possible throughout the year. When water temperatures drop in the fall, the intake will be moved to the 40°F level until water temperatures rise in the spring (Appendices A.1 and O). All water is gravity flow to the hatchery.

Red River

Red River is supplied by gravity flow from an intake located at the bottom of the South Fork of Red River, 225 yd upstream from the facility. The water flow of 8.18 cfs is right for the facility. During low flow in the summer, about 5 cfs is available to the hatchery. Temperatures ranged from 33°F in the fall to 74°F in early August (Appendix A.2). There were 14 days during the summer of 1991 when water temperatures reached 70°F or higher.

Crooked River

Crooked River rearing raceways are supplied by an intake 200 yards upstream of the raceways at Crooked River. The water rights stipulate cfs at the rearing facility; in late summer only 6 cfs is available. The water right is for 10 cfs at the adult trapping facility. Temperatures ranged from 68°F in mid-August to 34°F in late September (Appendix A.2). All temperatures were taken at the adult trap. All water supplied to both facilities is gravity flow.

Powell

The intake is located 100 yards upstream from the facility. Powell's water right for the gravity intake is 6.24 cfs from a gravity flow system on Walton Creek, and 2.5 cfs from a supply pumped out of White Sands Creek. Two 7.5 horsepower pumps can be used to supply Walton Creek with water from White Sands Creek during periods of low water. Water temperatures ranged from 45.8°F to 50.2°F from the Walton Creek intake and 41°F to 65°F from the White Sands pump station (Appendix A.2)

Water Quality Analysis

Clearwater

The water quality analysis report was done by the Idaho Department of Health and Welfare water quality laboratory in Boise (Appendix B.1). The samples were taken from the hatchery incubation supply line on August 4, 1994.

The water supply at CFH has a total alkalinity (as CaCO_3) of 16 mg/l which is very low with regard to fish culture. This may prove a stress factor for some species on stocks of fish which are not adapted to this type of chemistry.

Red River

Water quality analysis was taken at the facility rearing intake on July 20, 1994 (Appendix B.2).

Crooked River

Water quality analysis was taken at the facility rearing intake on July 14, 1994 (Appendix B.3).

Powell

Water quality analysis was taken at the facility rearing intake on July 27, 1994 (Appendix B.4).

STAFFING

Staffing at CFH consists of eight permanent staff members; 1 Fish Hatchery Manager II, 2 Assistant Hatchery Manager's, 1 Utility Craftsman, 3 Fish Culturists and an Office Secretary. The rest of the crew consists of temporary employees with the positions as Fishery Technicians, Biological Aides, Laborers, and YCC enrollees. The Red River, Crooked River, and Powell facilities are manned by one temporary person each, who are supervised by the CFH personnel.

1993 CHINOOK BROOD YEAR REPORT

Clearwater Hatchery

Incubation

Fertilized eggs from spring chinook salmon were spawned from Powell, Red River, Crooked River, and Rapid River (Rapid River stock) were transported to CFH for incubation. All fertilized eggs were transported in individual egg tubes to CFH. The transport vehicle was met at the front gate, egg tubes were removed from egg coolers and placed in clean egg coolers containing 200 ppm Argentyne solution for ten minutes. The clean egg coolers were then taken to the incubation room and eggs were placed into Heath egg trays with one or two females/tray. All Heath stacks were operated at approximately 5.0 gal/min.

A total of 936,572 green eggs were incubated from Powell stock, 99,908 green eggs from Red River stock, 614,789 green eggs from Crooked River stock, and 2,429,592 green eggs from Rapid River stock.

A total of 4,080,861 green eggs were incubated from BY93 spring chinook salmon. Overall eyed-eggs numbered 3,855,611 for a total eye-up percentage of 84.27%. Eye-up was achieved as follows: Powell 80.27%; Red River 87.68%; Crooked River 88.38%; and Rapid River 84.67%.

All Rapid River stock eggs from high levels of BKD parentage were destroyed. A total of 225,250 fertilized eggs were discarded during the 1993 spring chinook salmon incubation period at CFH.

Beginning on the fourth day of incubation, all eggs lots were treated with formalin to minimize fungal development. Treatments were administered three times per week at a 1:600 concentration (1,667 ppm) for 15 minutes and continued until each egg lot accumulated 800 thermal units (TU's).

Eye-up occurred at approximately 500 TU's, at which time all egg lots were shocked and picked using a Jensorter egg picking machine. The electronic counter on the Jensorter was used to enumerate all egg lots. All egg trays and screens were cleaned by pressure washing before any eyed-eggs were placed in them for final incubating.

Prior to hatching, all eyed-eggs were picked a second time. The second pick occurred at approximately 675 TU's. Hatching occurred at approximately 1,000 TU's, at which time all egg lots were picked a third time. All trays received a fourth and final pick at 1,500 TU's to remove any dead yolk-sac fry. Swim-up fry were transferred to the early rearing vats at approximately 1,750 TU's (Appendix C). Survival of green eggs to swim-up fry averaged 82.52%.

At eye-up, all Red River, Powell, and Crooked River eggs from high levels of BKD parentage were segregated from the medium, low, and negative BKD parentage. This segregation continued into early rearing, at which time all high BKD positive fish were destroyed.

Early Rearing Procedures

At swim-up, fry were moved to hatchery vats 1 through 60 with a loading of approximately 50,000 fish/vat. Survival from eyed egg to swim-up was 3,158,284 fish (97.93%). All fish were divided as evenly as possible into the vats, while still keeping fish separated by stock, egg spawning lots, and by fish from high BKD parentage. Fish were started in a full vat with baffles in place. Initial water flows were set at 46 gal/min for approximately 11 days to start the fry on feed. Water flows were increased to 92 gal/min on day 12 and remained set at that rate until day 40 when flows were increased to 120 gal/min. Flows remained at 120 gal/min for the remainder of early rearing. Water flows did decrease slightly when more than 40 vats were

in use. Minor flow adjustments were made to maintain the 120 gal/min flow regime. Flow indices were held at or below 1.41 while DI never exceeded 0.39 during the entire early rearing period.

All spring chinook destined for supplementation plants and fall release from the satellite facilities were fin-clipped, coded-wire tagged, and Passive Integrated Transponder (PIT) while being moved from early rearing to final rearing except Rapid River stock, which were transferred as unmarked fingerlings to the Crooked River satellite's rearing raceways. All chinook salmon being reared at CFH to full term smolt were transferred to the outside raceways as unmarked fingerlings averaging 125 fish/lb. Average length of the largest fish held in early rearing was 3.06 inches, averaging 100 fish/lb and were held in the vat room longer than any other group to complete fish marking operations.

No significant fish mortalities occurred during early rearing. There was some drop-off of cripples and "pinheads" during the first few months, as well as a small drop out due to *Pseudomonas (sp)* and *Renibacterium salmoninarum*.

Water temperatures for the early rearing period ranged from 5°C to 12°C (42° to 54°F). Whenever the water temperatures exceeded 13°C (56°F) for more than two days, we cooled the water temperature by lowering the primary intake or adding more secondary water.

Bioproduct starter and Biomoist grower formula were used to feed all lots of fish during early rearing. A total of 25,591 lbs of food was used at a cost of \$18,951. The conversion rate of this period was 1.52 lbs of feed for one lb of gain.

Final Rearing Procedures

The juvenile chinook were moved from vats 1 through 60 to chinook raceways, steelhead raceways, and satellite facilities. Powell spring chinook were moved into chinook raceways 1A, 2A, 3A, 1B, 2B, 3B, and a small number into 7A. Crooked River spring chinook were transferred into chinook raceways 4A, 5A, 4B, 5B, and 6B. Rapid River spring chinook were moved into chinook raceways 8A, 9A, 7B, 8B, 9B, and a small number into 7A. In addition, Rapid River spring chinook were moved into steelhead raceways 12E, 12W, 10W, 9W, 8W, and 9E. A total of 1,334,891 (at start of first medicated feed treatment) were transferred to outdoor raceways for final rearing.

Supplementation spring chinook salmon were held in steelhead raceways 11E, 11W, 12E-B, and 12W-B until August 29, 1994. A total of 596,819 spring chinook salmon were release for supplementation during August 1994: into Meadow Creek (417,000), White Sands Creek (99,808), Big Flat Creek (49,954), Pete King Creek (15,080), and Squaw Creek (14,977).

Satellite spring chinook salmon that were to be transferred to the satellite facilities were held in steelhead raceways for a short time prior to transport to each facility. The Powell satellite facility received 149,929 Powell stock and 162,524 Rapid River stock; Crooked River satellite facility received 199,800 Crooked River stock and 218,450 Rapid River stock. and the Red River satellite facility received 77,407 Red River stock and 249,267 Rapid River stock. A total of 1,057,377 spring chinook salmon were transferred to the satellite stations during the spring of 1994.

All spring chinook salmon being reared to full-term smolts at CFH received two medicated feed treatments during final rearing. The fish were fed Bioproduct's feed with 2.25% Aquamycin-100. The fish were fed between 75 and 150 mg Erythromycin/K to comply with Investigational New Animal Drug (INAD) specifications.

All supplementation spring chinook salmon were fed a single 21-day erythromycin feeding right after ponding. The fish were allowed a 21 -day withdrawal period to avoid toxicity during transportation and comply with INAD protocol.

The Powell stock (raceways 1A, 2A, 3A, 1B, 2B, 3B) full-term smolts were put in an experimental rearing test. Test raceways 1A, B and 3B were painted camouflage patterns to simulate natural stream colorations, and floating shade structures made of PVC heavy plastic netting (approximately 50% shading) were placed the length of the raceways. Raceways 1B, 2A, and 3A were control raceways which incorporated standard rearing practices.

The Crooked River stock (raceways 4A, 5A, 6A, 4B, 5B, 6B) full-term smolts were put in an experimental rearing test. Test raceways 4B, 5A, and 6A were painted camouflage patterns to simulate natural stream colorations, and floating shade structures made of PVC heavy plastic netting (approximately 50% shading) were placed the length of the raceways. Raceways 4A, 5B, and 6B were control raceways which incorporated standard rearing practices.

The most noticeable difference of behavior occurred in the first three weeks after the fish were ponded. Fish in the camouflage painted raceways reacted a lot more calmly as you walked by on the catwalks than fish did in the normal raceways. After approximately three weeks, the algae covered the painted concrete walls and fish in painted raceways and nonpainted raceways reacted about the same as you walked down the catwalks. The painted concrete floors continued to remain visible because of raceway cleaning exercises performed three times/wk.

Rapid River stock chinook reared in steelhead raceways were on primary water only which reached water temperatures of 65 to 68°F. These fish were fed the same diet, feed rate, and feed schedule as Rapid River chinook being reared in the chinook raceways. There was a great difference in feed conversion and growth rate of fish reared in the two different areas which was likely be attributed to the significantly higher water temperature in the steelhead raceways.

Bioproducts' Biomoist grower and BioDiet feed was the diet used throughout the final rearing period. A total of 108,187 lbs of fish food was used during final rearing at a cost of \$68,175.30. Total feed used in early and final rearing was 133,778 lbs at a cost of \$87,126.30 (conversion rate of 1.18:1). Percent body weights ranged from 15.0% to 1.5% (Appendix K).

Most chinook salmon were fed a week-on, week-off feeding program from July 1994 until March 1995. Fish were fed continuously during the weeks of medicated feed treatments. This feed regime was done to slow down growth, yet maintain fin quality and maintain fat reserves. No effects from this were detected; fin quality and fat reserves remained excellent. This program worked well at minimizing fish size but caused poor feed conversions as a result.

Water temperatures during the final rearing period in chinook raceways were kept as cool as possible to reduce growth rates on these fish. Water from the primary pipeline and secondary pipeline were mixed to achieve this (Appendix A.1). Hatchery water temperatures varied from 6°C to 14°C (42°F to 57°F) during the final rearing period with an estimated 2 cfs of water supplied to each raceway.

Fish Health

Diseases Encountered and Treatment. The main hatchery was virtually free of pathogens during this past brood year. Steelhead and chinook health was exceptional, no pathogens were detected during most of 1994. In January 1995, a mysterious mortality was experienced in the chinook raceways. These fish appeared to be bloated and anemic. No pathogens were cultured from moribund fish. Mortality was associated with moldy feed (aflatoxin). Approximately 3.5% of the population was lost in this mortality. Fish were taken off feed and mortality ceased. The remainder of the rearing period at Clearwater was relatively disease free (Appendix M.1).

Acute Losses. Losses caused by moldy feed reached 0.25%/d for several weeks on the hatchery. No other acute losses were experienced on this hatchery.

Organosomatic Index. Index is provided for stocks for the samples taken (Appendices M1, M2, M3, and M4).

Other Assessments Captive broodstock rearing at CFH is at a point that changes in rearing tanks must take place or the project needs to be relocated. Innovated problem solving will be the key to progress in captive chinook. Nutrition and container design may be limiting factors. In general, the oldest captive brood fish at CFH were not "happy" fish.

During the last few months of final rearing to full-term smolts, a size of smolt at release study, and a micro nutrients evaluation was initiated. There were three different release groups and three different sizes. The largest fish are at 13.4 fish/lb; the medium size group are at 18.8 fish/lb; and the small group were at 22 fish/lb. These groups contain PIT tags, which will be detected at Lower Granite Dam in an effort to evaluate the size of smolt to release for the best migration downstream. The idea of micro nutrients was initiated when studies showed the quantitative analysis of the tissue of wild fish were higher in selenium, zinc, and copper than hatchery-reared fish. An enhanced diet is being used to try to assimilate these micro nutrients during the last few months of rearing.

We also have on staff a graduate student from the University of Idaho who will be working on this project, compiling data and putting together statistical analysis, for his masters thesis. Additional migration data were collected using a 300 ft raceway fitted with notched baffles. Preliminary results indicated that the first night, 50% of the medium, 57.2% of the enhanced diet, and 71.8% of the large fish migrated down this channel.

After the migration test was finished, 20 fish from each group were analyzed using Goede's autopsy method to compare general health and condition of fish. Gill samples were collected for analysis of ATPase activity and red blood cell samples were tested using a peroxidation assay. The preliminary result of the peroxidation assay indicated that in two raceways, the enhanced diet may improve the red blood cells ability to withstand oxidation over the control groups. However, in the third raceway, the opposite result was indicated.

Finally, 25 fish from each group were tested for saltwater tolerance by placing them directly into sea water for 24 hours. All the sample fish survived the 24 hour test indicating the fish were well smolted. The fish were removed and autopsied to determine percentage of precocial males and to collect blood plasma samples. The plasma will be tested for sodium levels to determine differences in ability to osmoregulate in sea water.

Fish Marking

All 3,369,336 BY93 spring chinook released from CFH were marked with a fin removal (Appendix I). This includes 1,262,435 right ventral (RV) clip and 2,109,901 adipose (AD) fin-clips. Extra marks were added to 883,560 fish with coded-wire tags (CWT) and 21,194 with PIT.

Fish Distribution

A total of 77,407 Red River and 249,267 Rapid River stock were transported to Red River rearing pond on June 9 through 22, 1994. A total of 199,800 Crooked River and 218,450 Rapid River stock were transported to Crooked River raceways on June 20 and 21, 1994. A total of 149,929 Powell stock and 162,289 Rapid River stock were transported to Powell rearing pond on June 3, 23 and 27, 1994 (Appendix L).

Chinook supplementation fingerling releases There was a total of 17 release sites where chinook fingerlings were released. A total of 596,819 were reared at CFH; 429,851 were reared at Sweetwater Hatchery, near Lapwai; for a grand total of 1,026,670 fingerlings were released for chinook supplementation (Appendix D).

Full-term smolt No full term smolts were released at Red River facility. Crooked River facility received 258,293 fish from the Crooked River stock which were transported during the week of March 27, 1995 for a two-

week acclimation period. During the week of April 10, 1995, a total of 279,615 Rapid River stock were transported to Crooked River for a direct release comparison to acclimated fish. Also during the week of March 27, 1995, 290,417 fish were transported to the Powell rearing pond for a two-week acclimation. A total of 189,612 from Rapid River stock were transported to Newsome Creek and released into the stream on April 10 and 11, 1995. A total of 221,449 fish from Rapid River stock were transported to American River on April 5 through the 10, 1995 and directly released. A total of 35,509 fish from Rapid River stock and 19,791 Powell stock were transported to Papoose Creek on April 5 and 6, 1995 and directly released.

Red River

Adult Chinook Collection

The weir and trap put into operation on June 9, 1993 was taken out of operation September 15, 1993. A total of 139 fish were trapped: 73 adult males, 65 females and one jack (Appendices E.1, F.1, and F.4). The water flow through the trap for adult attraction and adult holding pond is 4.5 cfs.

Fish released directly from the trap above the weir to spawn naturally were 48 adult males, 42 adult females, and one jack. The number of fish ponded and held for spawning were 23 adult males and 23 adult females. There were seven pre-spawn mortalities of adult males. No adult females died prior to spawning (Appendix G.1).

Age-class breakdown of this run was one jack, 48 four-year-old males, 25 five-year-old males, 51 four-year-old females, and 14 five-year-old females. The age-class breakdown was as follows: less than 25 inches (64cm) were jacks, over 25 inches (64cm) to 32 inches (82cm) were four-year-olds, and 32 inches (82cm) and over were five-year-olds. The breakdown is from limited historic CWT data from Ron Lindlund and Rodney Duke (Appendices G.1 and H, J.1).

Holding and Spawning

All spring chinook salmon adults were injected with erythromycin 200 to inhibit BKD. Erythromycin injections were determined by a dosage rate table developed at the University of Idaho.

Fish being held for spawning were treated every other day with 100 ppm formalin drip for one hour. After the first sort, all fish were treated every day with 100 ppm formalin drip until spawning was complete. Females were checked for ripeness two d/wk. The first female was ripe and spawned on August 10, 1994. Eggs from each female were first spawned into a colander and drained of ovarian fluid; then placed into a bucket containing the sperm of one male and activated with one cup of well water. Eggs were water-hardened in a minimum 100 ppm iodophor solution. The solution was then drained from the eggs and the eggs were placed into transport tubes, submerged in water in a cooler with a half of a three lb coffee can of ice added. The cooler was strapped down with a bungee cord, secured in the back of a pickup and transported to CFH. (See Appendix C for individual egg take numbers).

Kidney and ovarian tissue samples were collected at the time of spawning. These samples were air mailed the next day to the Eagle Fish Health Lab for BKD and virus testing. All carcasses were returned to the Red River drainage system to add nutrients to the system.

Incubation

After water hardening at the adult facility green eggs were transported to CFH. The transport vehicle was met at the front gate; egg tubes were removed from egg coolers; and placed in clean egg coolers containing 200 ppm Argentyne solution for ten minutes. The clean egg coolers were then taken to the incubation room and eggs were placed into heath egg trays with one or two females per tray.

Early Rearing Procedures

All early rearing took place at CFH. Fish were transported to the Red River rearing pond at 94.5 fish/lb on June 9 and 22, 1994.

Final Rearing

All Red River fish were administered two Aquamycin medicated feedings. The first feeding was right after ponding and the second was completed prior to release on September 23, 1994. These fish were fed at a variable body weight ranging from 2.0% to 3.0%. The growth rate ranged from zero in/month in September, because they were off feed during an *Ichthyophthirius (Ich)* outbreak, to 0.5 in/month in August. Final DI was 0.04 and FI was 0.85.

Fish Health

Diseases Encountered and Treatment. Red River spring chinook reared at the Red River satellite for fall release were in good health for most of the rearing cycle. During August these fish began to flash. Shortly thereafter, mortalities began to rise and a diagnosis of *Ich* was made. A formalin treatment was started the next morning. Mortality was controlled and the parasite's life cycle was broken. Healthy fish were released in the fall of 1994. Preliberation samples did not find any trophozoites of *Ich* or any viral pathogens, and ELISA found two of four pools positive for *Renibacterium*. Direct Fluorescent Antibody Test (DFAT) analysis did not find *Renibacterium* in the fish sampled (Appendix M.2).

Organosomatic Index. Included.

Acute Losses. Acute losses were experienced at Red River due to *Ichthyophthirius multifiliis*. Total mortality was 5,390 fish from this parasitic infestation. Treatment with formalin was successful.

Other Assessments. Despite having the external parasite infestation of *ICH*, preliberation and organosomatic sampling indicated healthy fish at release.

Fish Marking

All Red River stock spring chinook salmon received a left ventral (LV) clip at CFH prior to being transported to the Red River satellite facility. There were 2000 PIT and 60,000 CWT tags in this group (Appendix I).

Fish Distribution

A total of 320,755 spring chinook salmon were directly released from the rearing pond into Red River on September 23, 1994. The fish were 46.2 fish/lb at the time of release (Appendix L).

Crooked River

Adult Chinook Collection

The weir and trap were put into operation on June 8, 1993 and removed on September 10, 1993. A total of 402 fish were trapped: 185 males, 210 females, six jacks, and one jill (Appendices E.2 and F.2). Flow through the trap for adult attraction was 10 cfs.

There were 52 adult males and 50 adult females released directly from the trap above the weir to spawn naturally. The ponded fish consisted of 25 adult males and 25 adult females, held until ripe, then released into

a confined section of the upper Crooked River drainage to spawn naturally. Prespawning mortality was recorded as 30 adult males and 7 adult females (Appendix G.2).

Age-class breakdown of this run was one jill, 6 jacks, 50 four-year-old males, 135 five-year-old males, 69 four-year-old females, and 141 five-year-old females. The age-class breakdown was as follows: less than 25 inches (64cm) were jacks or jills, over 25 inches (64cm) to 32 inches (82cm) were four-year-olds and 32 inches and over were five-year-olds. Breakdown is from limited historic CWT data (Appendices G.2, H and J.2).

Holding and Spawning

There is no adult holding at this site. Trapped fish from this facility must be transported 28 miles to the Red River facility. These adults were held separate from the Red River stock.

All fish were injected with Erythromycin 200 to inhibit BKD. Fish being held were also treated every other day with a 100 ppm formalin drip for one hour to prevent the growth of fungus. After the first sort these fish were treated every day with 100 ppm formalin drip for one hour. Adult mortalities were returned to Crooked River to add nutrients to the system. (See Appendix C for individual egg-take numbers).

The females were checked for ripeness twice a week. The first ripe female was spawned on August 10, 1994. Eggs from each female were first spawned into a colander, drained of ovarian fluid; then transferred into a bucket containing the milt of one male. One cup of well water was then added to activate the sperm. Fertilized eggs were rinsed, poured into egg transport tubes, and placed in a 100 ppm iodophor solution to water harden for one hour. The egg tubes were then removed from the iodophor solution and placed into a transport container filled with water. The lid was secured with bungee cord then secured in the back of a pickup and transported to CFH. Tissue and ovarian fluid samples were collected during spawning. The samples were air mailed within the next two days to the Eagle Fish Health Lab for BKD and viral testing. All carcasses were returned to the Crooked River drainage system to add nutrients to the system.

Incubation

All green eggs were transported in individual egg tubes to CFH. The transport vehicle was met at the front gate, egg tubes were removed from egg coolers and placed in clean egg coolers containing 200 ppm Argentynine solution for ten minutes. The clean egg coolers were then taken to the incubation room and eggs were placed into Heath egg trays with one or two females per tray.

Early Rearing Procedures

All early rearing took place at CFH. Fish were transported to the Crooked River rearing pond at 122.5 fish/lb (Rapid River stock) and 87.4 fish/lb (Crooked River stock) on June 20 (Rapid River stock) and 21, 1994 (Crooked River stock).

Final Rearing

All Crooked River fish were fed Aquamycin medicated feed twice. The first feeding occurred right after ponding and the second was completed prior to release on September 19, 1994. The fish were fed at a variable body rate ranging from 1.7% to 2.9%. The growth rate ranged from 0.2 in/month in September to 0.6 in/month in August. The FI and DI's were 1.46 and 0.23, respectively.

Fish Health

Diseases Encountered and Treatment Fish reared at the Crooked River satellite ponds for fall release in 1994, 1993 Crooked River spring chinook were not positive for *R. salmoninarum* via DFAT, but had

low optical densities in all pools sampled via ELISA. Viral and whirling disease samples were all negative. *Ichthyophthirius multifiliis* was found in low prevalence (one trophozoite per twenty fish).

Crooked River 1993 spring chinook acclimated in the spring of 1994 at the Crooked River satellite still had a very low prevalence of cataracts. The actual cause of these maladies has not been identified. The cataracts normally appear in the South raceways which have baffles. Preliberation sampling found no pathogens for *R. salmoninarum*, viral samples, and whirling disease.

Organosomatic Index. See Appendix M.3

Acute Losses. No acute or chronic losses.

Other Assessments. Fish at Crooked River appear to be very robust healthy animals. It is important to monitor for the pathogens *M. cerebralis* and *R. salmoninarum* in wild and feral fish in Crooked River and its tributaries.

Cataracts may be caused by gas bubble trauma (chronic), transportation trauma, or trauma experienced at Crooked River. To identify the cause, an investigation with serial necropsies, documenting histopathologic changes will have to be implemented (Appendix M.3).

Fish Marking

Fall release of Crooked River stock spring chinook salmon received a RV clip prior to being transferred to the Crooked River satellite facility for final rearing. There were 1,000 PIT tags in this group (Appendix I).

Spring release Crooked River stock spring chinook salmon received an AD fin-clip and a CWT tag. There were 2,400 PIT's in this group (Appendix I).

Fall release of Rapid River stock spring chinook salmon received an AD fin-clip only and 1,000 PIT tags.

Fish Distribution

A total of 415,535 spring chinook salmon were released from the rearing raceways into Crooked River on September 19 and 30, 1994, averaging of fish/lb on the release date (Appendix L).

In addition, a total of 258,293 spring chinook salmon which were reared at CFH to full term smolt were released from the raceways into Crooked River on April 14, 1995. The fish were transferred to the Crooked River satellite facility on March 29, 1995, acclimated in the rearing ponds for two weeks, and volitionally released from the rearing raceways into Crooked River. The volitional release started on April 10, 1995 and all fish were completely released by April 14, 1995. The fish were 17 fish/lb on the release date (Appendices I and L).

Powell

Adult Chinook Collection

The weir and trap on Walton Creek, installed on June 10, 1993 was removed on September 9, 1993. A total of 500 fish were trapped, 250 males, 242 females, and eight jacks (Appendices E.3 and F.3).

The floating weir across the Lochsa River was not installed this year. All fish returning to the Powell trap were considered hatchery stock and were ponded for spawning. Water flows through the trap and ponds were 6.2 cfs. Pre-spawning mortalities were 50 adult males and 20 adult females for a mortality rate of 5.6% (Appendices G.3).

Age-class breakdown of this run was 8 jacks, 82 four-year-old males, 168 five-year-old males, 122 four-year-old females, and 120 five-year-old females. The age class breakdown was as follows: less than 25 in (64cm) were jacks, over 25 in 64(cm) to 32 in (82cm) were four-year-olds, and 32 in (82cm) and over were five-year-olds. Our breakdown is from limited historic CWT data from Clearwater Regional Fisheries Biologist (Appendices G.3, H and J.3).

Holding and Spawning

Ponded fish were injected with Erythromycin 200 to inhibit BKD. Fish being held for spawning were also treated every other day with 100 ppm formalin drip for one hour. After the first sorting, all fish were treated every day with 100 ppm formalin drip for one hour.

Females were sorted twice per week for ripeness, and 207 females were spawned during ten spawning days between August 8 and September 6, 1993. All fish carcasses were returned to the Lochsa River drainage to add nutrients to the system.

Eggs were water hardened in a 100 ppm Argentyne solution for one hour in egg tubes, drained and transported in fresh water to CFH for incubation. Tissue and ovarian samples were collected at the time of spawning. These samples were air mailed the next day to Eagle Fish Health Lab for BKD and virus testing. (See Appendix C for individual egg take numbers.)

Water temperatures varied from 4°C to 16°C (38°F to 61°F) through the summer (Appendix A.2).

Incubation

All green eggs were transported to CFH. The transport vehicle was met at the front gate, egg tubes were removed from egg coolers and placed in clean egg coolers containing 200 ppm Argentyne solution for ten minutes. The clean egg coolers were then taken to the incubation room and eggs were placed into Heath egg trays with one or two females/tray.

Early Rearing Procedures

All early rearing took place at CFH. Fish were transported to the Powell satellite facility at 84.5 fish/lb on June 3, 23, and 27, 1993.

Final Rearing

All Powell stock fish were administered two Aquamycin medicated feedings. The first feeding occurred shortly after ponding and the second was completed prior to release on October 3, 1994. The fish were fed at a variable body weight ranging from 1.6% to 2.9%. The growth rate ranged from .50 in/month in September to .85 in/month in August. The final FI and DI's were 0.60 and 0.05, respectively.

Fish Health

There were no fish health problems during rearing season at Powell pond (Appendix M.4).

Fish Marking

Fall release Powell stock spring chinook salmon received an AD fin-clip at CFH prior to being transferred to the Powell satellite facility for final rearing. There were 2,400 PIT's and 290,417 CWT's in this group (Appendix I).

Fish Distribution

A total of 311,690 spring chinook salmon from Rapid River and Powell stock were released from the rearing pond into Walton Creek on October 3, 1994. The fish were 25 fish/lb on the release date (Appendix I).

A total of 290,417 spring chinook salmon which were reared at CFH to full-term smolt, transferred to the Powell pond on March 28, 1995, and were released April 13, 1995. The fish were acclimated in the rearing pond for two weeks and volitionally released from April 12 and April 13, 1995. All remaining fish were forced from the pond on April 13, 1995. The fish were 17.7 fish/lb on the release date (Appendix L).

Rapid River

Spawning

Excess green eggs were received from Rapid River Hatchery, located in Riggins, Idaho every Tuesday and Friday during the spawning period from August 19 to September 7, 1993. On each of the spawning days, CFH personnel went to Rapid River Hatchery to spawn the fish and load eggs for transport. The eggs were placed into individually marked egg tubes, water hardened in 100 ppm Argentyne, and then transported to CFH in fresh water. At the hatchery entry gate, the eggs in the tubes were transferred to clean egg coolers containing 200 ppm Argentyne for ten minutes, then placed into the incubators.

Tissue and ovarian samples were taken at the time of spawning by Rapid River Hatchery personnel and tested by Eagle Fish Health Lab personnel.

Prior to eye-up all high BKD positive eggs from Rapid River stock were culled and destroyed. A total of 225,250 fertilized eggs were destroyed.

Incubation

All eggs collected from brood year 1993 adults were transported as fertilized eggs to CFH and incubated until swim-up.

Early Rearing Procedures

All early rearing took place at CFH.

Final Rearing

Rapid River stock chinook reared in steelhead raceways were on primary water, (water temperatures of 65°F to 68°F). These fish were fed the same diet, feed rate, and feed schedule as Rapid River chinook being reared in the chinook raceways. There was a great difference in feed conversion and growth rate of fish reared in the two different areas. This most likely can be attributed to the significantly higher water temperature in the steelhead raceways.

The Rapid River supplementation spring chinook salmon were fed Aquamycin medicated feed for 21 days and then allowed a 21-day withdrawal period. The fish were transported to Selway Falls and Red River Hot Springs, and helicopter released into the Meadow Creek drainage, a tributary of the Selway River. The release was a cooperative effort between IDFG and the Nez Perce Tribe.

All Rapid River spring chinook salmon reared to full term smolt received two Aquamycin medicated feed treatments prior to release. The first was administered shortly after ponding, while the second was received directly after the fish were marked. The duration of each treatment was 21 days.

Fish Health See Appendix M.1

Fish Marking

Fall release Rapid River stock spring chinook salmon all received AD fin- clips prior to release at Powell, Crooked River, and Red River satellite facilities. In addition, Powell release fish received 100% CWT's and 1000 PIT's. Crooked River and Red River release fish received 64,850 CWT's and 1000 PIT's each.

Rapid River stock of spring chinook salmon were AD fin-clipped and were directly released into Crooked River. There were also 60,000 CWT's and 1,599 PIT's in this group.

Spring release Rapid River and Powell spring chinook salmon planted in Papoose Creek received an RV clip. There were also 400 PIT's in this group (Appendix I).

Fish Distribution

Rapid River spring chinook were released from Powell (162,524), Crooked River (218,450) and Red River (249,267) satellite facilities during October 1994 as pre-smolts.

A total of 417,000 spring chinook fingerlings were released from July 12 through July 29, 1994 in Meadow Creek, a tributary of the Selway River, for the Nez Perce Tribe.

A total of 726,185 spring chinook smolts were released in April of 1995. During April 10 through April 14, 279,615 fish were released in Crooked River; 35,509 were released into Papoose Creek on April 5 and 6; 221,449 were released into American River on April 5 through the 10; and 189,612 were released into Newsome Creek on April 10 and 11, 1995 (Appendix L).

BROOD YEAR 1994 STEELHEAD REPORT

ABSTRACT

Clearwater Fish Hatchery (CFH) received 905,000 eyed North Fork B-run steelhead eggs from Dworshak National Fish Hatchery (DNFH). Also, 67,516 eyed eggs from a mixture of Selway and North Fork stocks were received at CFH. Fish from the Selway stock eggs will be on a two-year rearing cycle and released as full-term smolts in the spring of 1996. In addition, 136,603 North Fork stock will be reared on a two-year cycle. A total of 587,962 smolts from the North Fork stock were released from April 18 through 20, 1995 into three sites on the South Fork of the Clearwater River and Clear Creek, a tributary of the middle fork of the Clearwater: 105,402 at the confluence of Cottonwood Creek; 119,292 upstream from the town of Stites; 179,556 at Mill Creek (Red House Hole); and 183,712 at Kooskia Hatchery on Clear Creek. Also, 50,781 North Fork stock fish were released into the South Fork of Red River.

The size of fish at release was 6.9 fish/lb, for a total of 85,363 lb average length was 185 mm (7.29 in). A total of 136,683 lbs of feed was fed (18,000 Rangen, 118,683 Bioproducts) with a cost of \$69,043.07 to produce 85,363 lbs of fish at CFH. The conversion rate was 1.6.

Author:

Jerry McGehee
Fish Hatchery Manager II

Clearwater

This is the third brood year of DNFH (North Fork stock) reared at CFH. This stock of steelhead reared is considered to be B-run (Clearwater River) fish.

Synoptic History

Brood Source

The source for Dworshak (North Fork) stock B-run steelhead eggs was DNFH.

Disease History

There is a long history of Infectious Hematopoietic Necrosis Virus (IHNV) at DNFH; therefore, CFH only accepts steelhead eggs from IHNV-negative females and follows a strict disinfection protocol when transporting them onto the station.

Spawning

Dworshak North Fork Stock: When eggs were being collected for CFH and DNFH, Several of the crew assisted with the spawning operation. All the disease samples were collected, packaged, and shipped by air mail to Eagle Fish Health Lab.

Incubation

Dworshak North Fork stock: Eyed steelhead eggs were received from DNFH on April 15 to May 6, 1994 in four weekly shipments (Appendix N). The eggs from DNFH lots 10 through 13 were incubated approximately 17 days at DNFH until the eggs were eyed-up. All eggs from negative IHNV females were disinfected and transported to CFH. The transport vehicle was met at the front gate, egg tubes were removed from egg coolers, and placed in clean and tempered egg coolers containing 200 ppm Argentyne solution for 10 minutes. The clean egg coolers were then taken to the incubation room, eggs were placed into Heath egg trays with approximately 5,000 eggs per basket, and water flows through each stack were set at six gal/min. A total of 905,000 eggs were received.

Early Rearing Procedures

Dworshak North Fork stock: At swim-up, unfed fry from DNFH stock B-run steelhead were moved to vats 9 through 28 and were divided as evenly as possible (43,500 fish/vat). The initial DI was 0.03 and FI was 0.12. Fish were held in the hatchery vats until October 1994 when they were moved to 8 steelhead raceways (4 through 7, east and west), 3 east, and chinook raceways 10 A and B). Average length of the fish at the end of early rearing was 4.83 in and averaged 25.4 fish/lb. The two-year rearing fish remained inside and were at 51.8 fish/lb and 3.8 in.

This brood year experienced fish losses from a *Columnaris* and *Aeromonas* outbreak which occurred from August to October, 1994 during warmwater temperatures. The loss from this outbreak was about 3,000 (0.4%) fish.

Water temperatures for the early rearing period ranged from 10°C to 18°C (50° to 64.4°F) (Appendix O). Whenever the temperatures exceeded 13°C (56°F) for more than two days, the water was cooled by either blending in more secondary water or by lowering the primary intake in Dworshak Reservoir. Gaining clearance to lower the intake requires 24-hour prior notice to the control room at the dam, so there was always some lag-time in making the adjustment. There were also times during the year when we could not get clearance to enter the log boom because the dam was spilling water.

Bioproduct's starter and BioDiet grower were used to feed these fish during the early rearing period, in which 17,094 lbs of feed was used to achieve a 1.28:1 feed conversion.

Final Rearing Procedures

Dworshak North Fork Stock: The juvenile DNFH stock B-run steelhead were moved from vats 9 through 48 to steelhead raceways, 3 east through 7 east, and 4 west through 7 west. The fish (60,000) were placed in chinook raceway 10A for a fin study. The move outside was done during the period of September 30 to October 14, 1994. The move was done in conjunction with fin-clipping and CWT tagging to avoid double stressing the fish. All fin-clipping was done in 16 hour shifts. The baffles were removed from vats and fish were then moved to the clipping trailers using the a four-inch fry pump. A portion of the fish were clipped through a portable ad-clipping table, loaded into 200 gallon tanks, and transported to the raceways. (Appendix P).

After fin-clipping, 50,781 DNFH (at 52 fish/lb) were transported to the upper South Fork of Red River and released. This release was postponed from the original release day until a 10-day medicated feed treatment was administered, including a 21-day de-tox period, due to *Columnaris* and *Aeromonas* mortalities. They were planted out on October 27, 1994.

The DI of the Dworshak steelhead ranged from 0.10 to 0.22, and the FI ranged from 0.30 to 0.83. These indexes were recalculated biweekly and were never allowed to exceed DI of 0.25 or FI of 1.5.

Water temperatures during final rearing period were maintained to keep temperatures as close to 13°C (56°F) as possible (Appendix O). Reservoir water temperatures began to drop in early October, 1994 and bottomed in January 1995 at 4°C (40°F). Temperatures began to slowly increase in March and had reached 5.1°C (42°F) by April 1995 when the steelhead smolts were being transported and released. Estimated water flows per raceway was 2.8 cfs.

Fish were fed dry feed until released. A total of 119,589 lbs of feed was used during final rearing to produce 72,046 lbs fish at a cost of \$36,390.43. The overall conversion rate from fry to smolt was 1.66. Percent body weight fed ranged from 0.70% to 3.20%.

Floating shade structures were installed in all of the steelhead raceways. The fish appeared to utilize them during the daylight hours, especially when overhead movement (feeding and cleaning) occurred.

Fish Health

Brood Year 1994 steelhead encountered the first disease outbreak in the history of CFH. The diseases these fish encountered were *Columnaris* and *Aeromonas*. The first signs of *Columnaris* and *Aeromonas* were detected on August 30, 1994 by Fisheries Pathologist, Doug Burton. At the same time, *Aeromonas* was discovered by Fisheries Pathologist, Doug Munson. The disease outbreak was precipitated by warmwater temperatures from our primary intake. The drawdown of Dworshak Reservoir required hatchery personnel to continually raise the primary intake during the months of September and October to prevent the pipeline from hanging up on to the face of the dam. Water temperatures peaked at 64°F during this disease outbreak (Appendix Q). Secondary water was diverted from incubation through the vat room and the upweller jar system. This allowed us to mix and cool the affected vats from 60°F to 56°F. A 3% salt solution was also tried in the vats. The more severe vats were placed totally on secondary water at 48°F. Primary was at 63°F at peak. All other fish received treatment after clipping and moved outside. The steelhead were fed 4% TM-100 medicated feed for treatment of the *Aeromonas*. A total of 4,500 fish were lost during this disease outbreak.

A portion of the steelhead were on a week-on/week-off feeding program. These fish broke out with *Columnaris* where the fish which were on a continual feeding program did not.

Fish Marking

All but 50,781 (supplementation) DNFH steelhead were AD fin-clipped with some receiving CWT's between September and October, 1994. A total of 269,812 fish were marked with LV, AD fin-clips and CWT's. A total of 318,150 fish were adipose clipped only. An additional 50,781 fish CWT without a fin-clip and 5,000 were PIT tagged for supplementation. An additional 1,800 fish were PIT tagged prior to full smolt releases (Appendix P).

Fish Distribution

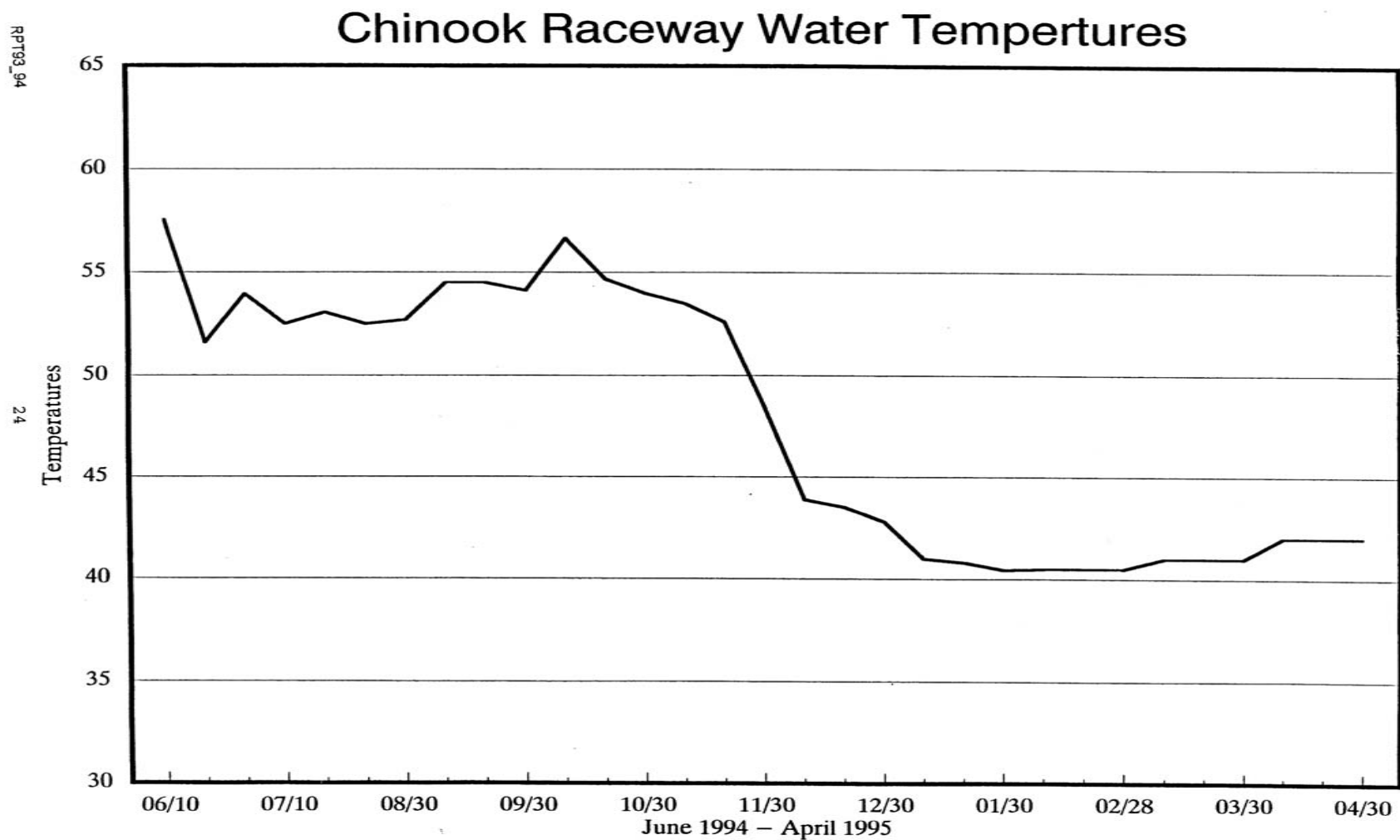
Between April 18 and 20, 1995, a total of 587,962 DNFH B-run steelhead were direct released at three plant sites on the lower South Fork of Clearwater River. These include 105,402 (6.7/lb) at the mouth of Cottonwood Creek; 119,292 (6.9/lb) upstream from the town of Stites at milepost 18; and 179,556 (6.4/lb) at Red House Hole (approximately 3.5 miles upstream of Highway 14 junction). The remaining 183,712 (7.5 /lb) DNFH B-run steelhead were direct released into Clear Creek at Kooskia Hatchery on the Middle Fork of the Clearwater River. A total of 49,871 North Fork stock were released into the South Fork of Red River. There was very little crowding and hauling mortality from fish transport to the release sites (Appendix Q).

ACKNOWLEDGMENTS

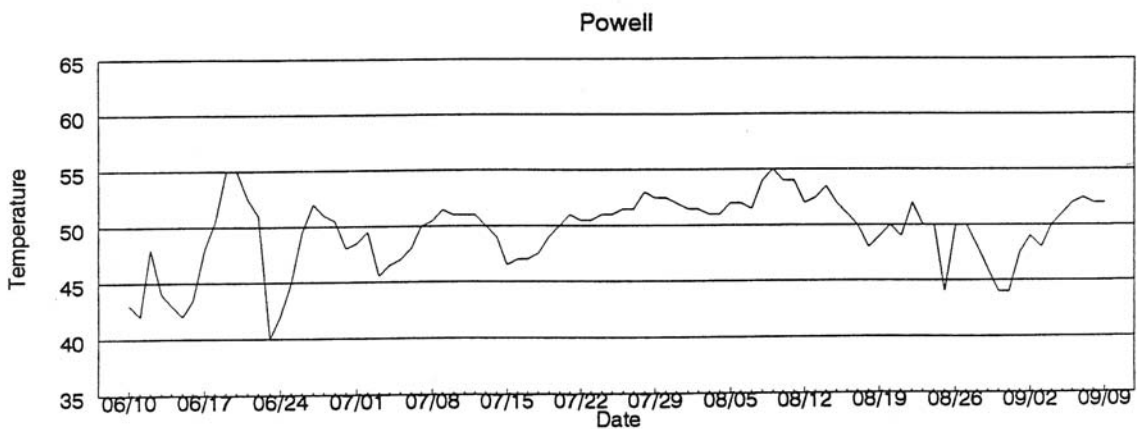
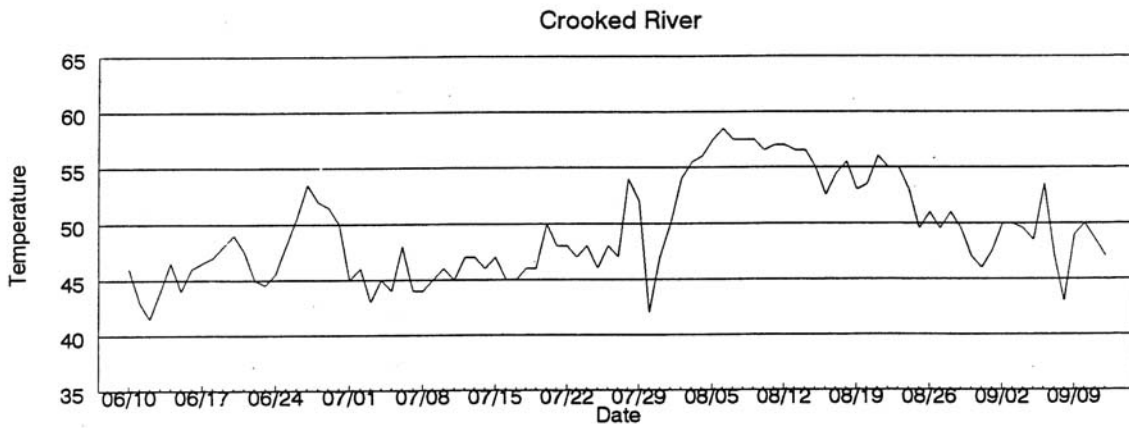
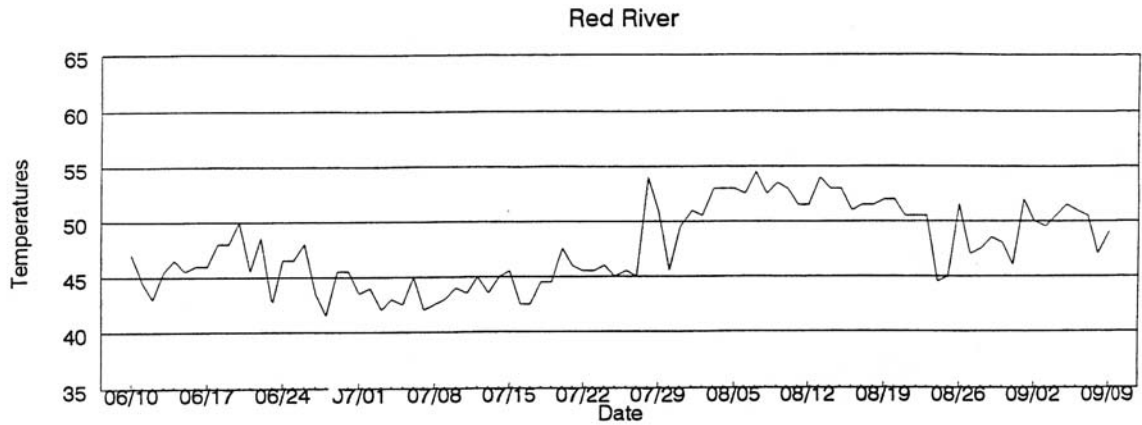
The CFH crew is large and are all assigned a wide diversity of responsibilities. Everyone on station has contributed to the success of the program. The hatchery crew consists of: Jerry McGehee (Hatchery Manager); Brad George, Scott Patterson and Brad Dredge (Assistant Hatchery Manager's); John Rankin, CalLee Davenport and Bob Turik (Fish Culturists); Ernie Yost (Utility Craftsman); Rene'e Hedrick (Office Secretary); Don Davis, Ric Downing and Don West (Fish Technicians); Dave Robertson, Dale Kellar, Bob Nelson, Jim Niles, Jeremy Olson, Brian Spence, Tim Snyder, Kim West, Colby Van Vooren, John Zakrjasek, Bob Lobdell, Leroy Jones and Sophia Adkins (Bio-aides); Dave Rising and Chris Estrada (Laborers).

Special acknowledgment goes to Ernie Yost, Utility Craftsman, and Don West, Ric Downing, and Don Davis, Fisheries Technicians, whose work was critical in getting the physical and mechanical aspects of the fish hatchery and satellites to function; Dave Robertson for analyzing and reporting size of smolt and micro nutrients research information; CalLee Davenport and Bob Turik, Fish Culturist's, who helped with editing of this report; and especially to Rene'e Hedrick for her persistence in completion of this report during the typing and editing process.

APPENDICES



Appendix A.2. Mean Water Temperatures for Satellites



Appendix B.1. Water quality analysis - Clearwater Fish Hatchery August 4, 1994.

ANALYSIS	RESULTS (mg/l)	DATE ANALYZED	OPTIMAL REARING LEVEL
Alkalinity	16.0	08/04/94	120 - 400 mg/
Ammonia (as N)	<0.005	08/04/94	0.0125
Arsenic	<0.01	08/04/94	N/A
Barium	<0.1	08/04/94	N/A
Cadmium	<0.001	08/04/94	<.0004 mg/l
Calcium	3.8	08/12/94	N/A
Chloride	0.9	08/12/94	N/A
Chromium	<0.01	08/04/94	0.1
Color (C.U.)	15	08/12/94	N/A
Copper	<0.02	08/04/94	<.006 mg/l
Cyanide	<0.005	08/12/94	N/A
Detergents (surfactant)	<0.08	08/09/94	N/A
Fluoride	<0.1	08/30/94	N/A
Hardness	14.0	08/04/94	120 - 400 mg/
Hydrogen Sulfide	<0.01	08/15/94	N/A
Iron	<0.02	08/11/94	N/A
Lead	<0.005	08/04/94	<.03 mg/l
Magnesium	<0.8	08/11/94	N/A
Manganese	<0.01	08/11/94	N/A
Mercury	<0.0005	08/11/94	<.002 mg/l
Nitrogen Nitrate	<0.013	08/18/94	0.2 mg/l
Potassium	0.5	08/12/94	N/A
Selenium	<0.005	08/10/94	N/A
Silica	11	08/30/94	N/A
Silver	<0.001	08/17/94	N/A
Sodium	1.5	08/17/94	N/A
Sulfate	<1	08/26/94	N/A
Total Dissolved Solids	28	08/11/94	80 mg /l
Zinc	<0.005	08/10/94	0.03 mg/l
pH (pH units)	7.20	08/09/94	6.5 - 8.0

Appendix B.2. Water quality analysis - Red River satellite rearing intake July 20, 1994.

ANALYSIS	RESULTS (mg/l)	DATE ANALYZED	OPTIMAL REARING LEVELS
Alkalinity	16.0	07/29/94	120 - 400 mg/l
Aluminum	100 ug/l	08/04/94	N/A
Ammonia	0.016 ug/l	08/04/94	0.0125 mg / l
Arsenic	<10 ug/l	08/04/94	N/A
Barium	<100 ug/l	08/01/94	N/A
Cadmium	<1 ug/l	08/02/94	<.0004 mg/l
Calcium	3.0	08/04/94	N/A
Chloride	1.1	08/05/94	N/A
Chromium	<10	08/03/94	0.1
Color (C.U.)	15 c.u.	07/28/94	N/A
Copper	<20 ug/l	08/01/94	<.006 mg/l
Cyanide	<0.005	07/27/94	N/A
Detergents (surfactant)	<0.08	08/08/94	N/A
Filterable Residue	43	07/25/94	N/A
Fluoride	<0.1	07/28/94	N/A
Hardness	18.0	08/04/94	120 - 400 mg/l
Hydrogen Sulfide	<0.01	07/26/94	N/A
Iron	<170 ug/l	08/01/94	N/A
Lead	<5 ug/l	08/02/94	<.03 mg/l
Magnesium	<0.6	08/11/94	N/A
Manganese	<10	08/01/94	N/A
Mercury	<0.5 ug/l	08/04/94	<.002 mg/l
Nitrate	0.007	08/04/94	0.03-.0.06
Potassium	0.5	08/12/94	N/A
Selenium	<5 ug/l	08/01/94	N/A
Silica	17	08/30/94	N/A
Silver	<1 ug/l	08/01/94	N/A
Sodium	3.0	08/01/94	N/A
Sulfate	<1	07/29/94	N/A
Zinc	<5 ug/l	08/01/94	0.03 mg/l
pH (pH units)	7.63	08/09/94	6.5 - 8.0

Appendix B.3. Water quality analysis - Upper Crooked River satellite rearing intake on July 14, 1994.

ANALYSIS	RESULTS (mg/l)	DATE ANALYZED	OPTIMAL REARING LEVELS
Alkalinity	15.0	07/29/94	120 - 400 mg/l
Aluminum	0.2	08/04/94	N/A
Ammonia	0.61	08/04/94	0.0125 mg / l
Arsenic	<0.01	08/04/94	N/A
Barium	<0.1	08/01/94	N/A
Cadmium	<0.001	08/02/94	<.0004 mg/l
Calcium	3.2	08/04/94	N/A
Chloride	0.9	07/22/94	N/A
Chromium	<0.01	07/27/94	N/A
Color (C.U.)	15	07/28/94	N/A
Copper	<0.02	08/01/94	<.006 mg/l
Cyanide	<0.005	07/27/94	N/A
Detergents (surfactant)	<0.08	08/08/94	N/A
Total dissolved solids	38	07/25/94	N/A
Fluoride	<0.1	07/28/94	N/A
Hardness	14.0	08/04/94	120 - 400 mg/l
Hydrogen Sulfide	<0.010	07/26/94	N/A
Lead	<.0005	08/02/94	<.03 mg/l
Magnesium	<0.06	08/11/94	N/A
Manganese	<0.60	08/01/94	N/A
Mercury	<0.0005	08/04/94	<.002 mg/l
Nitrogen	0.13	08/04/94	0.03-.0.06
Potassium	0.4	08/12/94	N/A
Selenium	<.005	08/01/94	N/A
Silica	14.6	08/30/94	N/A
Silver	<.001	08/01/94	N/A
Sodium	2.4	08/01/94	N/A
Sulfate	<1	07/29/94	N/A
Zinc	<.005	08/01/94	0.03 mg/l
pH (pH units)	7.37	08/09/94	6.5 - 8.0

Appendix B.4. Water quality analysis - Powell satellite intake rearing on July 27, 1994.

ANALYSIS	RESULTS (mg/l)	DATE ANALYZED	OPTIMAL REARING LEVELS
Alkalinity	24.0	07/29/94	120 - 400 mg/l
Aluminum	0.1	08/04/94	N/A
Ammonia	0.047	08/04/94	0.0125 mg / l
Arsenic	<0.01	08/04/94	N/A
Barium	<0.1	08/01/94	N/A
Cadmium	<0.001	08/02/94	<.0004 mg/l
Calcium	6.3	08/04/94	N/A
Chloride	1.1	07/22/94	N/A
Chromium	<0.01	07/27/94	N/A
Color (C.U.)	15	07/28/94	N/A
Copper	<.02	08/01/94	<.006 mg/l
Cyanide	<0.005	07/27/94	N/A
Detergents (surfactant)			
	<0.08	08/08/94	N/A
Total dissolved solids			
	37	07/25/94	N/A
Fluoride	<0.1	07/28/94	N/A
Hardness	22.0	08/04/94	120 - 400 mg/l
Hydrogen Sulfide	<0.016	07/26/94	N/A
Lead	<0.0055	08/02/94	<.03 mg/l
Magnesium	<1.1	08/11/94	N/A
Manganese	<0.10	08/01/94	N/A
Mercury	<0.005	08/04/94	<.002 mg/l
Nitrogen	0.043	08/04/94	0.03-.0.06
Potassium	0.5	08/12/94	N/A
Selenium	<.005	08/01/94	N/A
Silica	15	08/30/94	N/A
Silver	<.001	08/01/94	N/A
Sodium	2.2	08/01/94	N/A
Sulfate	<1	07/29/94	N/A
Zinc	<.005	08/01/94	0.03 mg/l
pH (pH units)	7.33	08/09/94	6.5 - 8.0

A positive Langlier index indicates a tendency of water to deposit calcium carbonate and a negative index indicates a tendency to dissolve calcium carbonate. This index is not related directly to corrosion but to the deposition of a thin coherent scale which may be protective. Therefore, a slightly positive index is frequently associated with non-corrosive conditions and a negative index indicates the possibility of corrosion.

Appendix C. Clearwater Hatchery percent eye-up of chinook egg inventory information BY93.

POWELL

LOT NUMBER	DATE SPAWNED	NUMBER OF FEMALES	NET EGG NUMBERS	EGGS PER FEMALE	NUMBER EYED EGGS	PERCENT EYE-UP
1 *	8/8	7	23,095	4,619	14,890	64.47
2 *	8/9	14	59,940	4,611	54,652	91.18
3 *	8/12	14	70,029	5,387	56,182	80.23
4	8/16	68	330,946	4,867	239,525	72.38
5	8/19	32	144,620	4,519	115,577	79.92
6	8/22	17	82,942	4,879	75,004	90.43
7	8/25	43	175,985	4,292	153,660	87.31
8	8/29	6	28,831	4,805	25,809	89.52
9	9/1	4	11,949	2,987	8,654	72.42
10	9/6	2	8,235	2,059	7,823	95.00
TOTALS		207	936,572	4,525	751,776	80.27

* TWO TRAYS LOST TO DEAD FEMALES SPAWNED AND TWO TRAYS TO BUBBLE SHOCKING.

CROOKED RIVER

LOT NUMBER	DATE SPAWNED	NUMBER OF FEMALES	NET EGG NUMBERS	EGGS PER FEMALE	NUMBER EYED EGGS	PERCENT EYE-UP
1 *	8/10	40	201,533	5,477	179,084	88.86
2	8/13	3	14,652	4,884	12,955	88.42
3	8/17	22	118,058	5,366	106,273	90.02
4	8/20	29	135,442	4,670	119,622	88.32
5	8/23	13	55,922	4,302	50,286	89.92
6	8/26	15	63,399	4,227	56,601	89.28
7	8/30	2	7,759	3,880	5,827	75.1
8	9/2	3	11,086	3,695	8,066	72.76
9	9/4	2	6,938	3,469	4,631	66.75
TOTALS		129	614,789	4,766	543,345	88.38

* THREE TRAYS WERE LOST TO DEAD FEMALES SPAWNED.

RED RIVER

LOT NUMBER	DATE SPAWNED	NUMBER OF FEMALES	NET EGG NUMBERS	EGGS PER FEMALE	NUMBER EYED EGGS	PERCENT EYE-UP
1	8/10	6	25,522	4,254	22,322	87.46
2	8/17	3	13,894	4,631	10,230	73.63
3	8/20	3	13,270	4,423	11,264	84.88
4	8/23	7	30,716	4,388	27,777	90.43
5	8/26	2	7,259	3,630	7,132	98.25
6	8/30	1	4,895	4,895	4,767	97.39
7	9/13	1	4,352	4,352	4,106	94.35
TOTALS		23	99,908	4,344	87,598	87.68

RAPID RIVER

LOT NUMBER	DATE SPAWNED	NUMBER OF FEMALES	NET EGG NUMBERS	EGGS PER FEMALE	NUMBER EYED EGGS	PERCENT EYE-UP
X1	8/19/93	25	85,547	4,502	54,336	63.52
X2	8/24/93	120	425,946	4,217	335,544	78.78
X3	8/27/93	120	468,309	4,257	429,150	91.64
X4	8/31/93	136	545,464	4,329	497,385	91.19
X5	9/3/93	47	200,818	4,564	182,726	90.99
X6	9/7/93	121	450,073	4,019	343,282	76.27
TOTALS		569	2,176,157	4,315	1,842,423	84.66

* HIGH BKD CULLED EGGS ARE NOT INCLUDED IN NET EGG NUMBERS.

Appendix D. Chinook supplementation fingerlings BY93.

**CHINOOK SUPPLEMENTATION
Fingerling Plants**

Hatchery		Clearwater		Year		1994				
Species	Stock	Brood Year	Release Site	Release Date	Number Released	Size No./lb	Length P.L. or T.L.	Pounds	Marks	Number of Marks Released
SC	Powell	93	Squaw Creek	7/5/94	(direct 3 sites) 14,977	100	77.6 mm	150	All RV 1000 PITS	14,977 RV
SC	Powell	93	Pete King	7/5/94	(direct 1 site) 15,080	100	77.6 mm	151	All RV 1000 PITS	15,080 RV
SC	Powell	93	Big Flat	7/6 - 7/8/94	(helicopter) 49,954	100	77.6 mm	499	All RV 1000 PITS	49,954 RV
SC	Powell	93	White Sands	7/6 - 7/8/94	(helicopter) 99,808	100	77.6 mm	998	All RV 1000 PITS	99,808 RV
SC	Rapid River	93	Meadow Creek	7/12/94	(helicopter) 61,272	113.75	74 mm	539	All RV 1000 PITS	61,272 RV
SC	Rapid River	93	Meadow Creek	7/14/94	(helicopter) 64,410	113.8	74 mm	566	All RV 1000 PITS	64,410 RV
SC	Rapid River	93	Meadow Creek	7/26/94	(helicopter) 63,952	121	73 mm	529	RV	63,952 RV
SC	Rapid River	93	Meadow Creek	7/27/94	(helicopter) 68,178	108	75.5 mm	631	RV	98,178 RV
SC	Rapid River	93	Meadow Creek	7/28/94	(helicopter) 77,760	108	75.5 mm	720	RV	77,760 RV
SC	Rapid River	93	Meadow Creek	7/29/94	(helicopter) 81,428	108	75.5 mm	754	RV	81,428 RV
TOTAL FOR CLEARWATER HATCHERY					596,819			5,537		

Appendix E.1. Red River chinook length frequencies BY93.

LENGTH (cm)	MALES	FEMALES	TOTAL
47	0	0	0
48	0	0	0
49	0	0	0
50	0	0	0
51	0	0	0
52	0	0	0
53	0	0	0
54	0	0	0
55	0	0	0
56	0	0	0
57	0	0	0
58	0	0	0
59	0	0	0
60	0	0	0
61	1	0	1
62	0	0	0
63	0	0	0
64	0	0	0
65	1	0	1
66	1	1	2
67	1	1	2
68	2	4	6
69	3	1	4
70	3	5	8
71	1	2	3
72	4	3	7
73	2	6	8
74	5	5	10
75	5	6	11
76	4	5	9
77	3	2	5
78	6	2	8
79	3	0	3
80	2	6	8
81	0	2	2
82	2	0	2
83	1	1	2
84	0	5	5
85	0	0	0
86	1	3	4
87	3	1	4
88	1	2	3
89	2	0	2
90	5	1	6
91	0	0	0
92	1	0	1
93	3	0	3
94	0	1	1

LENGTH (cm)	MALES	FEMALES	TOTAL
95	0	0	0
96	4	0	4
97	1	0	1
98	2	0	2
99	1	0	1
100	0	0	0
101	0	0	0
102+	0	0	0
TOTALS	74	65	139

Appendix E.2. Crooked River chinook length frequencies BY93.

LENGTH (CM)	MALES	FEMALES	TOTAL
47	0	0	0
48	0	0	0
49	0	0	0
50	0	0	0
51	0	0	0
52	1	0	1
53	0	0	0
54	0	0	0
55	0	0	0
56	0	0	0
57	0	0	0
58	1	0	1
59	0	0	0
60	1	0	1
61	1	0	1
62	0	1	1
63	2	0	2
64	6	1	7
65	1	0	1
66	5	2	7
67	5	1	6
68	2	5	7
69	4	2	6
70	3	7	10
71	0	4	4
72	5	7	12
73	5	2	7
74	3	5	8
75	4	2	6
76	1	2	3
77	1	2	3
78	0	2	2
79	0	0	0
80	0	7	7
81	3	3	6
82	2	15	17
83	1	6	7
84	6	18	24
85	8	11	19
86	4	15	19
87	4	10	14
88	6	30	36
89	5	8	13
90	16	22	38
91	9	7	16
92	10	3	13
93	9	6	15
94	18	2	20

LENGTH (CM)	MALES	FEMALES	TOTAL
95	13	1	14
96	4	0	4
97	4	0	4
98	7	0	7
99	2	1	3
100	4	0	4
101	1	0	1
102+	4	1	5
TOTALS	208	212	420

Appendix E.3. Powell chinook length frequencies BY93

Length (cm)	MALES	FEMALES	TOTAL
47	2	0	2
48	0	0	0
49	0	0	0
50	0	0	0
51	0	0	0
52	1	0	1
53	0	0	0
54	0	0	0
55	0	0	0
56	0	0	0
57	0	0	0
58	0	0	0
59	0	0	0
60	1	0	1
61	0	0	0
62	2	0	2
63	2	0	2
64	1	2	3
65	1	2	3
66	2	3	5
67	4	6	10
68	2	2	4
69	4	8	12
70	5	16	21
71	4	17	21
72	8	7	15
73	3	8	11
74	5	6	11
75	11	8	19
76	7	4	11
77	5	5	10
78	8	5	13
79	5	1	6
80	4	7	11
81	0	5	5
82	3	10	13
83	8	10	18
84	2	14	16
85	6	8	14
86	8	13	21
87	9	20	29
88	10	18	28
89	12	10	22
90	10	5	15
91	18	11	29
92	13	6	19
93	13	1	14
94	11	1	12

Length (cm)	MALES	FEMALES	TOTAL
95	14	1	15
96	5	0	5
97	7	2	9
98	8	0	8
99	6	0	6
100	4	0	4
101	0	0	0
102+	4	0	4
TOTALS	258	242	500

Appendix F.1. Red River satellite chinook run timing BY93.

	DATE	Male (jacks/adults)	Female	Total
June	10	0	0	0
	11	0	0	0
	12	0	0	0
	13	0	0	0
	14	0	0	0
	15	0	0	0
	16	0	0	0
	17	0	0	0
	18	0	0	0
	19	0	0	0
	20	0	0	0
	21	0	0	0
	22	0	0	0
	23	1	0	1
	24	0	0	0
	25	1	0	1
	26	4	3	7
	27	3	6	9
	28	4	3	7
	29	1	2	3
	30	3	0	3
July	1	1	2	3
	2	3	3	6
	3	7	9	16
	4	1	4	5
	5	1	3	4
	6	1	2	3
	7	3	2	5
	8	2	3	5
	9	1	3	4
	10	1	0	1
	11	0	1	1
	12	2	1	3
	13	0	0	0
	14	0	0	0
	15	0	0	0
	16	0	0	0
	17	0	0	0
	18	0	0	0
	19	0	0	0
	20	0	0	0
	21	0	0	0
	22	1	0	1
	23	0	0	0
	24	0	0	0
	25	0	0	0
	26	4	1	5
	27	1	1	2
	28	1	0	1
	29	1	1	2
	30	2	2	4
	31	1	0	1
Aug	1	1	0	1
	2	0	1	1

	DATE	Male (jacks/adults)	Female	Total
	3	0	0	0
	4	0	0	0
	5	1	0	1
	6	0	1	1
	7	1	2	3
	8	1	1	2
	9	0	2	2
	10	1	0	1
	11	1	0	1
	12	0	0	0
	13	3	0	3
	14	1	0	1
	15	2	0	2
	16	1	2	3
	17	0	0	0
	18	0	0	0
	19	1	0	1
	20	0	0	0
	21	2	2	4
	22	3	0	3
	23	1	0	1
	24	2	0	2
	25	0	1	1
	26	0	0	0
	27	0	0	0
	28	0	0	0
	29	0	0	0
	30	0	0	0
	31	0	0	0
Sept.	1	0	0	0
	2	0	0	0
	3	0	0	0
	4	0	0	0
	5	0	1	1
	6	0	0	0
	7	0	0	0
	8	1	0	1
Total		74	65	139

Appendix F.2. Crooked River satellite chinook run timing BY93

	DATE	Male (jacks/adults)	Female (jill/adult)	Total
June	8	0	1	1
	9	0	0	0
	10	1	0	1
	11	0	1	1
	12	0	0	0
	13	1	0	1
	14	0	0	0
	15	3	6	9
	16	8	11	19
	17	0	0	0
	18	1	1	2
	19	3	1	4
	20	1	1	2
	21	7	8	15
	22	2	2	4
	23	8	10	18
	24	0	1	1
	25	7	10	17
	26	4	5	9
	27	1	9	10
	28	17	9	26
	29	11	14	25
	30	0	0	0
July	1	10	9	19
	2	14	15	29
	3	12	10	22
	4	0	0	0
	5	1	1	2
	6	8	5	13
	7	9	9	18
	8	12	10	22
	9	8	8	16
	10	5	8	13
	11	7	10	17
	12	1	7	8
	13	0	0	0
	14	3	8	11
	15	3	2	5
	16	0	0	0
	17	1	0	1
	18	5	6	11
	19	0	0	0
	20	1	4	5
	21	2	0	2
	22	0	0	0
	23	1	0	1
	24	0	0	0
	25	2	1	3
	26	2	1	3
	27	0	0	0
	28	0	0	0
	29	1	1	2
	30	1	1	2
	31	2	1	3

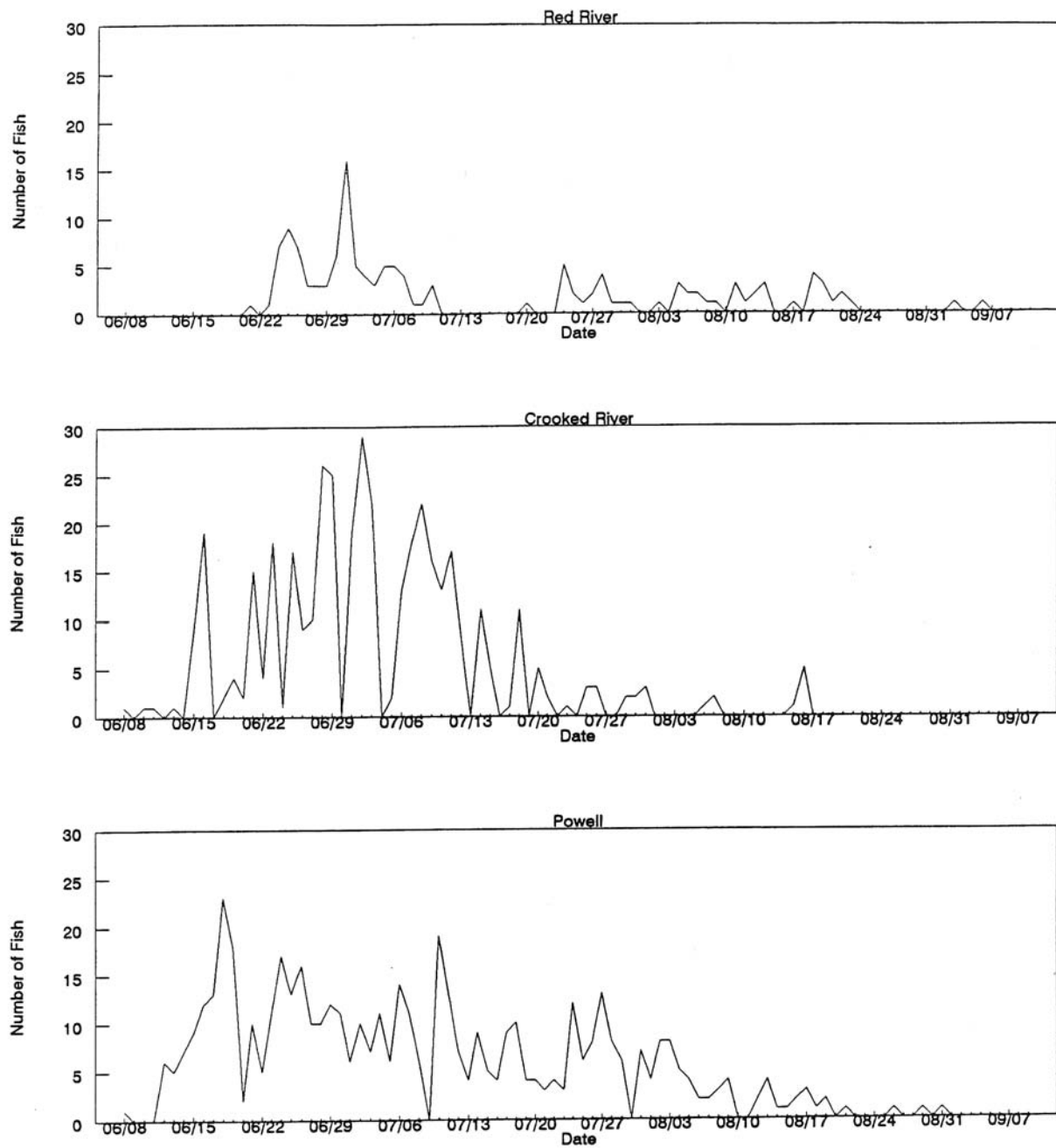
	DATE	Male (jacks/adults)	Female (jill/adult)	Total
Aug	1	0	0	0
	2	0	0	0
	3	0	0	0
	4	0	0	0
	5	0	0	0
	6	1	0	1
	7	2	0	2
	8	0	0	0
	9	0	0	0
	10	0	0	0
	11	0	0	0
	12	0	0	0
	13	0	0	0
	14	0	0	0
	15	0	1	1
	16	2	3	5
	17	0	0	0
	18	0	0	0
	19	0	0	0
	20	0	0	0
	21	0	0	0
	22	0	0	0
	23	0	0	0
	24	0	0	0
	25	0	0	0
	26	0	0	0
	27	0	0	0
	28	0	0	0
	29	0	0	0
	Total	191	211	402

Appendix F.3 Powell trap chinook run timing BY93

	DATE	Male	Female	Total
		(jacks/adults)	(jill/adult)	
June	11	0	1	1
	12	0	0	0
	13	0	0	0
	14	0	0	0
	15	3	3	6
	16	3	2	5
	17	4	3	7
	18	4	5	9
	19	6	6	12
	20	6	7	13
	21	13	10	23
	22	9	9	18
	23	2	0	2
	24	2	8	10
	25	2	3	5
	26	6	5	11
	27	13	4	17
	28	12	1	13
	29	6	10	16
	30	8	2	10
July	1	7	3	10
	2	5	7	12
	3	6	5	11
	4	5	1	6
	5	6	4	10
	6	4	3	7
	7	5	6	11
	8	3	3	6
	9	6	8	14
	10	2	9	11
	11	5	1	6
	12	0	0	0
	13	7	12	19
	14	4	9	13
	15	4	3	7
	16	1	3	4
	17	6	3	9
	18	2	3	5
	19	2	2	4
	20	6	3	9
	21	5	5	10
	22	1	3	4
	23	2	2	4
	24	2	1	3
	25	2	2	4
	26	2	1	3
	27	4	8	12
	28	5	1	6
	29	4	4	8
	30	6	7	13
	31	4	4	8
Aug	1	4	2	6
	2	0	0	0

	DATE	Male	Female	Total
		(jacks/adults)	(jill/adult)	
	3	4	3	7
	4	3	1	4
	5	1	7	8
	6	3	5	8
	7	1	4	5
	8	3	1	4
	9	1	1	2
	10	1	1	2
	11	2	1	3
	12	2	2	4
	13	0	0	0
	14	0	0	0
	15	2	0	2
	16	1	3	4
	17	0	1	1
	18	1	0	1
	19	0	2	2
	20	2	1	3
	21	1	0	1
	22	1	1	2
	23	0	0	0
	24	1	0	1
	25	0	0	0
	26	0	0	0
	27	0	0	0
	28	0	0	0
	29	0	1	1
	30	0	0	0
	31	0	0	0
Sept	1	1	0	1
	2	0	0	0
	3	1	0	1
		258	242	500

Appendix F.4. Red River, Crooked River and Powell chinook run timing graph, 1993.



Appendix G.1. Fish disposition, Red River Trap.

TOTAL FISH TRAPPED: 139		
AGE CLASSES	FEMALES	MALES
3 years	0	1
4 years	51	48
5 years	14	65

FISH DISPOSITION FEMALES:	
SPAWNED	23
RELEASED	42
MORTALITY	0
TOTAL	65

FISH DISPOSITION MALES:	
SPAWNED	23
RELEASED	49
MORTALITY	7
TOTAL	79*

*The number of males in each category above will not equal the total number trapped because individual fish may have been counted in more than one category.

All spawning carcasses and pond morts were put into a sanitation container and taken to a landfill.

Appendix G.2. Fish disposition, Crooked River Trap.

TOTAL FISH TRAPPED: 402		
AGE CLASSES	FEMALES	MALES
3 years	1	6
4 years	69	50
5 years	141	135

FISH DISPOSITION FEMALES:	
SPAWNED	129
RELEASED	75
MORTALITY	7
TOTAL	211

FISH DISPOSITION MALES:	
SPAWNED	129
RELEASED	77
MORTALITY	30
TOTAL	236*

*The number of males in each category above will not equal the total number trapped because individual fish may have been counted in more than one category.

All spawning carcasses and pond morts were put into a sanitation container and taken to a landfill.

Appendix G.3. Fish disposition, Powell Trap

TOTAL FISH TRAPPED: 500

AGE CLASSES	FEMALES	MALES
3 years	0	8
4 years	122	82
5 years	120	168

FISH DISPOSITION FEMALES:

SPAWNED	207
RELEASED	15
MORTALITY	20
TOTAL	242

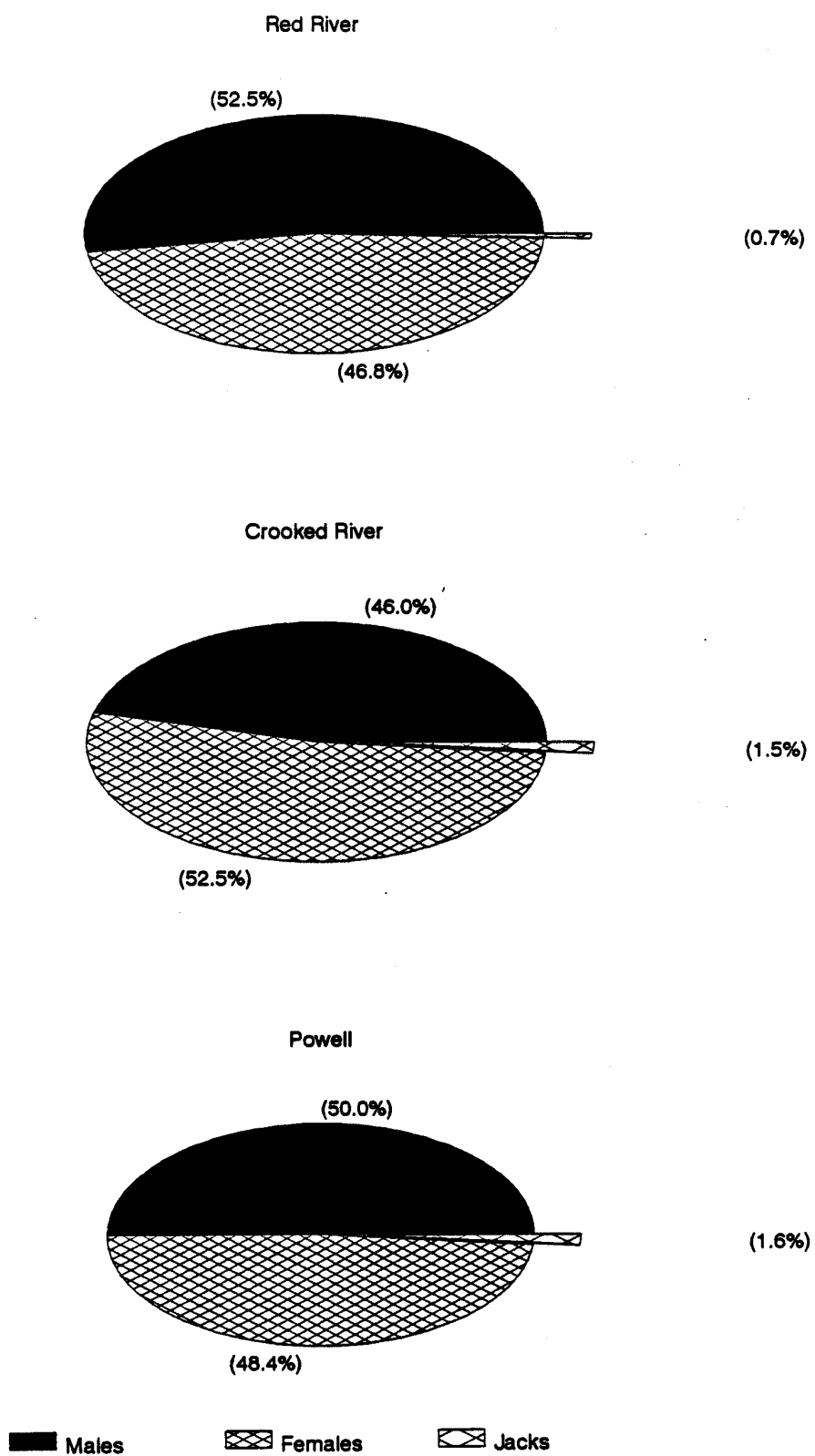
FISH DISPOSITION MALES:

SPAWNED	207
RELEASED	25
MORTALITY	50
TOTAL	282*

*On 8/25/93 a release of ponded adults occurred. A total of 25 males and 15 females were released into upper White Sands Creek at the Colt Creek Bridge. The number of males in each category above will not equal the total number trapped because individual fish may have been counted in more than one category.

All spawning carcasses and pond morts were put into a sanitation container and taken to a landfill.

Appendix H. Spring chinook salmon run composition, Red River, Crooked River and Powell BY93.



Appendix I. Clearwater Hatchery BY93 spring chinook marking and tagging.

Site	Date	Mark	CWT	PIT	Number	Fpp	Length
Squaw Cr	7/5/94	RV	0	1,000	14,977	100	3.6
Pete King Cr	7/5/94	RV	0	1,000	15,080	100	3.06
Big Flat Cr	7/6 - 8/94	RV	0	1,000	49,954	100	3.06
White Sands Cr	7/6 - 8/94	RV	0	1,000	99,808	100	3.06
Meadow Cr	7/12 - 29/94	RV	0	2,000	417,000	110	2.83
Orofino Cr	7/13/94	AD	0	0	47,713	74.1	3.35
Lower Selway River	7/18 - 22/94	AD	0	0	116,687	78.5	3.31
Lower White Sands	7/21/94	AD	0	0	165,957	78.0	3.31
Warm Springs	7/21/94	AD	0	0	18,687	78.5	3.31
Boulder Cr	7/21/94	AD	0	0	75,765	79.5	3.26
Weir Cr	7/21/94	AD	0	0	5,042	78.0	3.31
Sub - Total					1,026,670		

Pre - Smolts

Site	Date	Mark	CWT	PIT	Number	Fpp	Length
Powell	10/3/94	AD	210,000	2,000	311,690	25	4.61
Crooked River							
Production	9/30/94	AD	0	1,000	216,280	33.5	4.22
Supplementation	9/19/94	RV	0	1,000	199,255	32.9	4.26
Red River							
Production	9/23/94	AD	60,000	1,000	76,013	46.2	3.78
Supplementation	9/23/94	LV	0	1,000	244,742		3.78
Sub - Total					1,047,980		

Full Term Smolts

Site	Date	Mark	CWT	PIT	Number	Fpp	Length
Powell	4/12 - 13/95	AD	290,417	2,398	290,417	17.7	5.42
Crooked River	4/10 - 14/95						
Acclimated		AD	258,293	2,397	258,293	17.0	5.47
Non-acclimated		AD	64,850	1,599	279,615	18.6	5.28
American River	4/5 - 10/95	RV	0	1,200	221,449	18.8	
Newsome Cr	4/10 - 11/95	RV	0	1,200	189,612	22.3	
Papoose Cr	4/5 - 6/95	RV	0	400	55,300	16.8	5.53
Sub - Total					1,294,686		

TOTAL FISH MARKED 3,369,336

Appendix J.1. Summary of chinook returns to Red River by brood year

Brood year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plan
1982	Fall 1983 Spr 1984	260,000 40,000	2	1985	*	1986	107	1987	109	0.036%
1983	Spr 1985 ^b	80,000	*	1986	377	1987	259	1988	636	0.795%
1984	Spr 1986 ^b	136,800	35	1987	132	1988	74	1989	241	0.176%
1985	Fall 1986 ^c Spr 1987 ^c	96,400 96,800	3	1988	25	1989	13	1990	41	0.021%
1986	Fall 1987	233,100	5	1989	38	1990	8	1991	51	0.022%
1987	Fall 1988	291,200	2	1990	9	1991	3	1992	14	0.005%
1988	Fall 1989	240,500	1	1991	31	1992	39	1993	71	0.029%
1989	Fall 1990	273,800	5	1992	99	1993	13	1994	117	0.025%
1989	Spr 1991 ^d	63,000								
1989	Spr 1991 ^e	124,000								
1990	Fall 1991	354,700	1	1993	18	1994		1995	19	
1990	Spr 1992 ^f	207,500								
1991	Fall 1992	6,000	0	1994		1995		1996	0	0
1992	Fall 1993	22,246		1995		1996		1997	0	0.000%
1993	Fall 1994	320,755		1996		1997		1998		

*Trap was not installed in 1986 due to construction.

^bThese fish wintered in the rearing pond.

^cThese fish were Rapid River stock reared at Sawtooth and released directly into Red River with no acclimation.

^dPlanted off bridge at ranger station, reared at Dworshak National Fish Hatchery, Clearwater stock.

^ePlanted off bridge at ranger station, reared at Kooskia, Clearwater stock.

^fAcclimated in rearing pond for 21 days, transferred from Dworshak.

Appendix J. 2. Summary of chinook returns to Crooked River by brood year.

Brood year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1985	----	----	----	1988	----	1989	4	1990	4	ERR
1986	----	----	----	1989	23	1990	5	1991	28	ERR
1987	Spr 1989 ^a	199,700	2	1990	13	1991	7	1992	22	0.011%
1988	Spr 1990 ^b	300,407	2	1991	208	1992	276	1993	486	0.162%
1989	Fall 1990 ^c	339,087	13	1992	119	1993	10	1994	142	0.042%
1990	Fall 1991 ^a	320,400	7	1993	15	1994		1995	22	0.002%
1991	----	----	1	1994		1995		1996	1	0.000%
1992	Spr 1994 ^d	273,766		1995		1996		1997	0	0.000%
1993	Fall 1994 ^d Spr 1994 Spr 1995	415,535 258,293 279,615		1996		1997		1998	0	0.000%

^aTransferred from Dworshak Hatchery.

^bDirect release from Kooskia Fish Hatchery.

^cTransferred from Dworshak and Rapid River hatcheries.

^dEggs from Looking Glass Hatchery (Rapid River stock) reared at Clearwater Hatchery

Appendix J. 3. Summary of chinook returns to Powell by brood year.

Brood year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1984	Spr 1986	----		1987		1988	16	1989	16	ERR
1985	Spr 1987	----		1988	111	1989	20	1990	131	ERR
1986	Spr 1988 ^a	200,100	27	1989	157	1990	10	1991	194	0.097%
1987	Spr 1989 ^b	200,639	2	1990	16	1991	15	1992	33	0.016%
1988	Fall 1989	314,500	7	1991	249	1992	288	1993	544	0.173%
1989	Fall 1990 Spr 1991 ^c	307,100 180,764	6	1992	204	1993	57	1994	267	0.054%
1990	Fall 1991 Spr 1992 ^d Spr 1992 ^e	358,400 150,800 53,500	8	1993	28	1994		1995	36	
1991	Fall 1992 ^f Fall 1992 ^g	500	1	1994		1995		1996	1	
1992	Spr 1994 ^h Spr 1994 ⁱ Spr 1994 ^j	144,823 61,060 55,745		1995		1996		1997	0	0.000%
1993	Fall 1994 Spr 1995	311,690		1996		1997		1998		

^aRapid River stock reared at Dworshak.

^bClearwater stock reared at Kooskia and Dworshak.

^cClearwater stock reared at Kooskia; acclimated in rearing pond.

^dAcclimated 21 days in rearing pond before release into Walton Creek, transferred from Dworshak.

^eNot acclimated, transferred to rearing pond and immediately released.

^fThese smolts were released from the rearing pond to Walton Creek.

^gReleased at headwaters of Crooked Fork Creek

^hAcclimated 17 days, volitional release 5 days, release in Walton Cr.

ⁱNon-acclimated, transferred to rearing pond and immediately released.

^jReleased directly into Walton Creek

Appendix K. Brood year 1993 chinook and BY94 steelhead production cost

Rearing to Release	Chinook (BY-93)	Steelhead (BY-94).
No. Produced	3,369,336	637,743
Weight	107,879	85,363
Percent Mortality	27 *	14.5
Conversion Rate	1.3	1.6
*Includes eggs culled from 53 high BKD females		
Food Fed and Weight Gained		
Period Fed	12/3/93 - 4/11/95	6/5/94 - 5/1/95
Feed Used LBS.	133,778	136,683
Weight Gain	107,789	85,363
Feed Cost	\$87,126.30	\$69,043.07
Total Budget		\$837,366
Cost / pound steelhead and chinook		\$3.09

Appendix L. Chinook pre-smolt distribution for BY93.

Species	Stock	Brood Year	Release Site	Release Date	Number Released	Size No./lb	Length F.L. or T.L.	Pounds	Marks	Number of Marks Released
acclimated SC	Powell	1993	Powell	10/3/94	311,690	25.0	117	12,468	AD clip 210K CWT, 2K PIT	311,690
Acclimated SC	Crooked River	1993	Crooked River	9/19/94	199,255	32.9	108.2	6,056	RV clip 1K PIT	199,255
Acclimated SC	Rapid River	1993	Crooked River	9/30/94	216,280	33.5	107.3	6,456	AD clip 1K PIT	216,280
Acclimated SC	Red River / Rapid River	1993	Red River	9/23/94	320,755	46.2	96.1	6,943	AD & LV clip 60K CWT, 2K PIT	320,755
TOTAL					1,047,980			31,923		

Full Term Chinook Smolt Releases

Species	Stock	Brood Year	Release Site	Release Date	Number Released	Size No./lb	Length F.L. or T.L.	Pounds	Marks	of Marks Released
SC	Powell	1993	Papoose	4/5 – 6	19,791	16.8	5.53	1,178	RV clip all	400 PIT
SC	Powell	1993	Powell	4/12 – 13	290,417	17.7	5.42	16,408	AD clip all	290,417 CWT 2,397 PIT
SC	Crooked River	1993	Crooked River	4/10 – 14	258,293	17.0	5.47	15,217	AD clip all	258,293 CWT 2,397 PIT
SC	Rapid River	1993	Crooked River	4/10 – 14	279,615	18.6	5.28	15,181	AD clip all	64,850 CWT 1,599 PIT
SC	Rapid River	1993	Papoose	4/5 – 6	35,509	16.8	5.53	2,114	RV clip all	
SC	Rapid River	1993	American River	4/5 – 10	221,449	18.8	5.22	11,779	RV clip all	1,200 PIT
SC	Rapid River	1993	Newsome Creek	4/10 – 11	189,612	22.3	5.13	8,503	RV clip all	1,200 PIT
TOTAL					1,294,686					

Appendix M.1. Pathology chinook health report, Clearwater Hatchery.

ACCESSION NO:	95-170	LOCATION:	Clearwater
SPECIES:	Spring Chinook	AUTOPSY DATE:	04/10/95
STRAIN:	Rapid River	AGE:	Juv
UNIT:	chnk rwy	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson, Burton		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	45.70	3.01	0.07
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	7.12	0.57	0.08

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	20	1	0
B2	0	C	0	L	0	2	0	2	1	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	9	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean =0.00		4	10	E	0	Mean =0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean =0.00	
H2	0			O	0			Mean =0.00								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	20	20	0
SEX	M: 0		F: 0		U: 0						

GENERAL REMARKS:

FINS:	GONADS:
SKIN:	OTHER:

Appendix M.2. Pathology chinook health report, Red River

ACCESSION NO:	94-475	LOCATION:	Red River
SPECIES:	Spring Chinook	AUTOPSY DATE:	04/10/95
STRAIN:	Red River	AGE:	Juv
UNIT:	Red River pond	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson, Burton		
REMARKS:	nice fish		

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	37.62	3.87	10.29
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	5.55	0.47	8.42

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	20	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	0	1	0
B2	0	C	0	L	0	2	0	2	0	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	0	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean =0.00		4	20	E	0	Mean =0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean =0.00	
H2	0			O	0			Mean =4.00								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	20	20	0
SEX	M: 0			F: 0				U: 0			

GENERAL REMARKS:

FINS:	GONADS:
SKIN:	OTHER: no ICH found

Appendix M.3. Pathology chinook health report, Crooked River.

ACCESSION NO:	95-167	LOCATION:	Crooked River
SPECIES:	Spring Chinook	AUTOPSY DATE:	04/08/95
STRAIN:	Crooked River	AGE:	Juv
UNIT:	N & S ponds	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson, Burton		
REMARKS:	South ponds (11-20) not random sample		

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	52.45	8.73	0.17
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	8.05	2.69	0.33

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	13	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	7	1	0
B2	0	C	0	L	0	2	0	2	0	G	0	2	0	M	0	C	13	2	0
E1	0	M	0	S&L	0			3	13	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean =0.00		4	7	E	0	Mean =0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean =0.00	
H2	0			O	0			Mean =3.35								OT	0		
M1	0																		
OT	7																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	20	20	0
SEX	M: 0			F: 0				U: 0			

GENERAL REMARKS:

FINS:

GONADS:

SKIN:

OTHER: appear to be smolting

Appendix M.4. Pathology chinook health report, Powell.

ACCESSION NO:	95-168	LOCATION:	Powell
SPECIES:	Spring Chinook	AUTOPSY DATE:	04/09/95
STRAIN:	Powell	AGE:	Juv
UNIT:	Powell	SAMPLE SIZE:	20
REASON FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson, Burton		
REMARKS:	nice looking fish		

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	50.30	4.78	0.09
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.75	0.74	0.11

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	19	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	7	1	0
B2	0	C	0	L	0	2	0	2	3	G	0	2	0	M	0	C	13	2	0
E1	0	M	0	S&L	0			3	11	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean =0.00		4	6	E	0	Mean =0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean =0.00	
H2	0			O	0			Mean =3.15								OT	0		
M1	0																		
OT	1																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	20	20	0
SEX	M: 0	F: 0	U: 0								

GENERAL REMARKS:

FINS:

GONADS:

SKIN:

OTHER: eye was clear, non-functional

Appendix N. Clearwater Hatchery BY94 steelhead eggs received from Dworshak National Fish Hatchery.

Egg Take Number	Spawn Date	Eyed Egg Deliver Date	Number Eyed Eggs	Temperature Units
10	3/30/94	4/15/94	240,000	370
11	4/06/94	4/22/94	240,000	370
12	4/13/94	4/28/94	220,000	355
13	4/20/94	5/06/94	205,000	364
TOTAL			905,000	

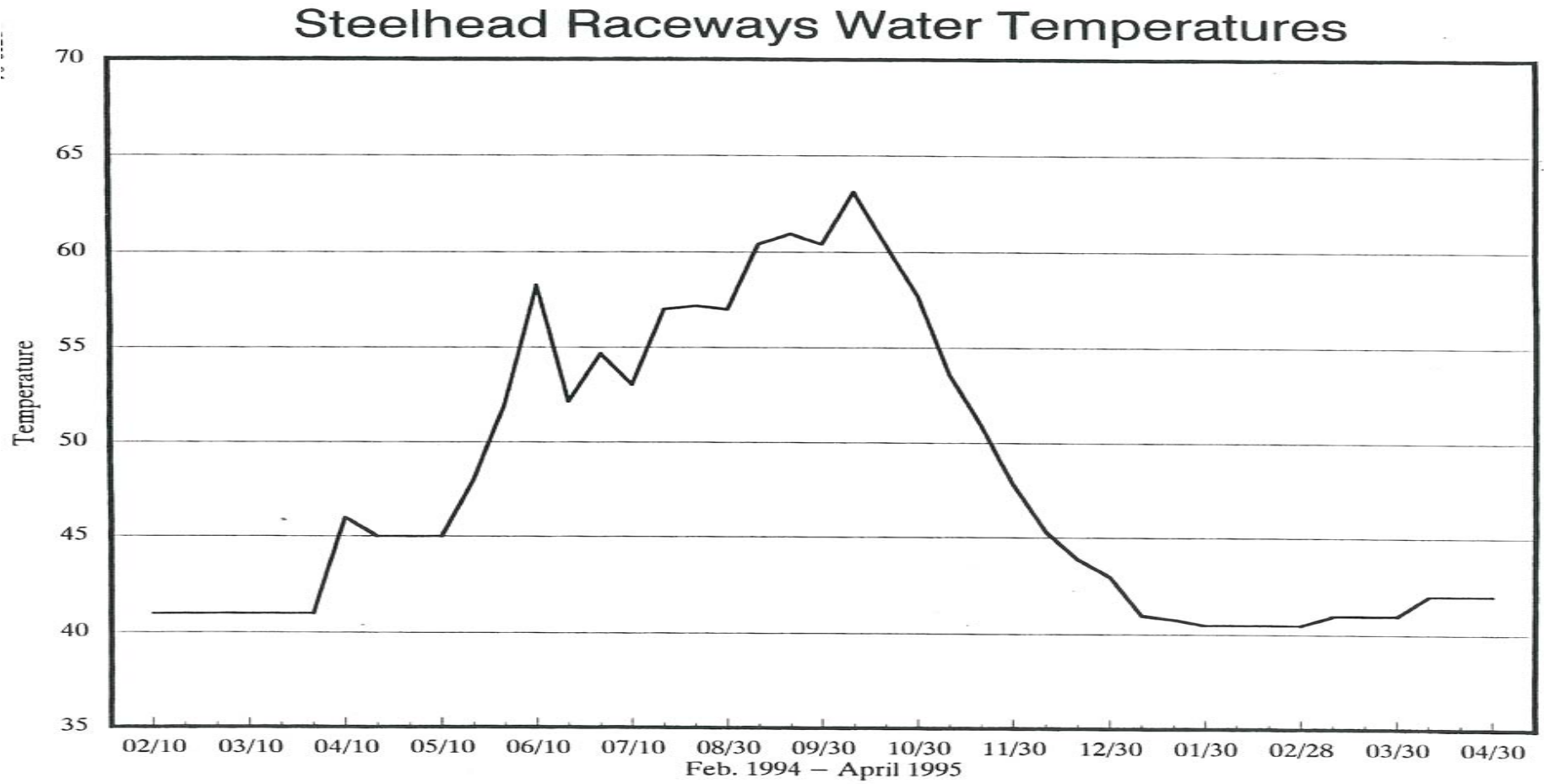
Machine enumeration done at Dworshak National Fish Hatchery.

Brood Year steelhead survival from eggs to released smolts.

Stock	# Green Eggs	#Eyed Eggs	Released Smolts	# Fish on two year program	Percent Survival
Dworshak	Reared at Dworshak	905,000	587,962	136,363 *	80%

*To be released spring 1996.

Appendix O. Clearwater steelhead water temperatures.



Appendix P. Steelhead marking North Fork BY94.

Site	Date Released	Number	CWT / LV	PIT	AD	Fpp	TOTAL POUNDS	Length
Clear Creek	4/18	183,712	183,712	899	183,712	7.54	24,351	7.24
Stites	4/19	119,292	21,400	300	119,292	6.93	17,207	7.29
Mill Creek	4/19 - 20	179,556	43,200	300	179,556	6.42	27,985	7.49
Cottonwood	4/10	105,402	21,500	300	105,402	6.66	15,820	7.44
So. Fork Red River	10/27/94	49,781	46,000	5,000	0	52.00		3.80
TOTAL		637,743					85,363	

Appendix Q. Steelhead smolt distribution in the Clearwater River tributaries.

Month	Total		Mortality %	
July	507		0.06	
August	1,534		0.18	
September	6,303		0.75	
	1 yr	2 yr	1 yr	2 yr
October	410	20	0.07	0.02
November	397	63	0.07	0.5
December	190	50	0.03	0.04
January 1995	92	20	0.02	0.01
February	87	20	0.01	0.01
March	79	12	0.01	0.01
April	78	35	0.01	< .03

Submitted by:

Jerry McGehee
Fish Hatchery Manager II

Brad Dredge
Assistant Fish Hatchery Manager

Approved by:

Steven M. Huffaker, Chief
Bureau of Fisheries

Bill Hutchinson
Hatcheries Manager